1. Hydrolysis-Induced Aqueous Gelcasting: The Latest Concept for Net-Shape Consolidation of Ceramics-A Review

By Ganesh, Ibram

This is a review article covering literature reported on consolidation of ceramic components out of aq.-based Al2O3, MgAl2O4 spinel, β-Si4Al2O2N6, β-SiAlON-SiO2 composite, and zirconia toughened alumina (ZTA) slurries following hydrolysis induced aq. gelcasting (henceforth referred to as GCHAS) route. GCHAS is a combination of aq. gelcasting (GC) and hydrolysis assisted solidification (HAS) routes. The advantages of GCHAS over other net-shape forming techniques in the fabrication of certain important ceramic structures such as thin wall radomes have been reviewed in this article. Interestingly, among the various colloidal-based net shape forming techniques available, GCHAS has been found to be a most promising one for consolidating complex-shaped ceramic structures with significantly high green strength and high product yield. Sintered properties of ceramics consolidated by GCHAS are compared and discussed with those of similar ceramics consolidated by aq. slip casting (SC), GC, HAS, and a conventional dry-powder pressing (DP) of freeze dried granules in this article.

~1 Citing

2. Preparation and characterization of Co-doped TiO2 materials for solar light induced current and photocatalytic applications

By Ganesh, Ibram; Gupta, A. K.; Kumar, P. P.; Chandra Sekhar, P. S.; Radha, K.; Padmanabham, G.; Sundararajan, G.

Different amts. of co-doped TiO2 powders and thin films were prepd. by following a conventional co-pptn. and sol-gel dip coating technique, resp. The synthesized powders and thin films were subjected to thermal treatments from 400-800°C and were thoroughly investigated by means of X-ray diffraction, XPS, energy dispersive anal. with X-rays, FT-IR, FT-Raman, diffuse reflectance spectroscopy, UV-visible spectroscopy, BET surface area, zeta potential, flat band potential measurements, band-gap energy, etc. The photocatalytic ability of the powders was evaluated by methylene blue (MB) degrdn. studies. The thin films were characterized by photocurrent and UV-visible spectroscopy techniques. The characterization results suggest that the co-doped TiO2 powders synthesized in this study consist mainly anatase phase, and possess reasonably high sp. surface area, low band gap energy and flat band potentials amenable to water oxidn. in photoelectrochem. (PEC) cells. The photocatalytic degrdn. of MB over co-doped TiO2 powders followed the Langmuir-Hinshelwood first order reaction rate relationship. The 0.1 wt.% co-doped TiO2 compn. provided the higher photocurrent, n-type semi-conducting behavior and higher photocatalytic activity among various co-doped TiO2 compns. and pure TiO2 investigated.

~0 Citings

3. Preparation and characterization of Fe-doped TiO2 powders for solar light response and photocatalytic applications

By Ganesh, Ibram; Kumar, Polkampally P.; Gupta, Abhishek K.; Sekhar, Panakati S. C.; Radha, Kalathur; Padmanabham, Gadhe; Sundararajan, Govindan

Different amts. of Fe-doped TiO2 (with 0.1 to 10 wt.% Fe) powders were prepd. at temps. in the range of 400 and 800 °C following a conventional co-pptn. technique and were thoroughly characterized by means of X-ray diffraction (XRD), Fourier-transform IR (FT-IR), Fourier-transform Raman (FT-Raman), diffuse reflectance spectroscopy (DRS), BET surface area, zeta potential and flat band potential measurements. Photocatalytic ability of Fe-doped TiO2 powders was evaluated by means of methylene blue (MB) degrdn. expts. conducted under the irradn. of simulated solar light. Characterization results suggested that as a dopant Fe stabilized TiO2 in the form of anatase phase, reduced its band gap energy and adjusted its flat potentials in such a way that these powders can be employed for photoelectrolysis of water into hydrogen and oxygen in photoelectrochem. (PEC) cells. The 0.1 wt.% Fe-doped TiO2 exhibited highest activity in the photocatalytic degrdn. of MB. The kinetic studies revealed that the MB degrdn. reaction follows the Langmuir-Hinshelwood first order reaction rate.

~0 Citings

4. Preparation and characterization of Ni-doped TiO2 materials for photocurrent and photocatalytic applications

By Ganesh Ibram; Gupta A K; Kumar P P; Sekhar P S C; Radha K; Padmanabham G; Sundararajan G
Different amounts of Ni-doped TiO(2) (Ni = 0.1 to 10%) powders and thin films were prepared by following a conventional coprecipitation and sol-gel dip coating techniques, respectively, at 400 to 800°C, and were thoroughly characterized by means of XRD, FT-IR, FT-Raman, DRS, UV-visible, BET surface area, zeta potential, flat band potential, and photocurrent measurement techniques. Photocatalytic abilities of Ni-doped TiO(2) powders were evaluated by means of methylene blue (MB) degradation reaction under simulated solar light. Characterization results suggest that as a dopant, Ni stabilizes TiO(2) in the form of anatase phase, reduces its bandgap energy, and adjusts its flat band potentials such that this material can be employed for photoelectrochemical (PEC) oxidation of water reaction. The photocatalytic activity and photocurrent ability of TiO(2) have been enhanced by doping of Ni in TiO(2). The kinetic studies revealed that the MB degradation reaction follows the Langmuir-Hinshelwood first-order reaction relationship.

5. Aqueous slip casting and hydrolysis assisted solidification of MgAl2O4 spinel ceramics

By Ganesh, I.; Sundararajan, G.; Ferreira, J. M. F.

This paper reports on synthesis of MgAl2O4 spinel (MAS) powders with six different chem. compns. and the consolidation of the synthesized MAS powders following an aq. slip casting and hydrolysis assisted solidification (HAS) routes. The synthesized MAS powders were surface passivated against hydrolysis before being dispersed in distd. water to obtain suspensions with 41-45 vol.% solid loading using suitable dispersing agents. In the case of the HAS process, the consolidation of suspensions was achieved in non-porous molds under ambient conditions by the incorporation of AlN equiv. to 1-5 wt%Al2O3 into the suspension. The stoichiometric MAS powder consolidated by slip casting and dry pressing routes was sintered along with those consolidated by HAS route at 1550-1650°C for 1 h. Various characterization techniques were utilized to evaluate the effect of compn. and consolidation technique on slurry characteristics and sintered properties of MAS ceramics.

6. Aqueous slip casting of MgAl2O4 spinel powder

By Ganesh, Ibram

A stoichiometric MgAl2O4 spinel (MAS) powder was synthesized by calcining a compacted mixt. of α-Al2O3 and calcined caustic MgO at 1400°C for 1 h and was surface treated against hydrolysis using an ethanol soln. of H3PO4 and Al(H2PO4)3 after fine grinding. Aq. suspensions with 41-45 vol.% treated powder were prepd. using tetra Me ammonium hydroxide (TMAH) and an ammonium salt of polyacrylic acid (Duramax D-3005) as dispersing agents. These stable suspensions were consolidated in plaster molds by slip casting (SC) route for the first time. For comparison purposes, the treated powder was also compacted by die-pressing technique after converting into freeze-dried granules and sintered along with slip cast samples at 1550-1650°C for 1-2 h. The MAS ceramics fabricated by slip casting and die-pressing exhibited comparable properties.

7. Conversion of carbon dioxide to methanol using solar energy

By Ganesh, Ibram
From Current Science (2011), 101(6), 731-733. Language: English, Database: CAPLUS

Conversion of carbon dioxide into methanol or to any other value-added chem. using solar light (known as artificial photosynthesis) is of great importance from the point of view of energy crisis and global warming problem. This note discusses the methods and challenges that need to be addressed for realizing processes for converting carbon dioxide to value-added chems.

~0 Citings

~3 Citings

~1 Citing

~1 Citing
8. Conversion of carbon dioxide to methanol using solar energy—a brief review

By Ganesh, Ibram

This article presents a meticulous and comprehensive review of literature reported on conversion of carbon dioxide, a greenhouse gas into methanol or to any other value added chem. following various routes including catalytic, thermal, biol., electrochem. and photoelectrochem. (PEC). More emphasis is given on conversion of carbon dioxide to methanol using solar energy (i.e., artificial photosynthesis) as this process can tackle the human generated two pressing problems, i.e., "global warming" and "energy crisis" today world is facing. It also covers information on various materials required for designing and development of reliable PEC cells for conversion of carbon dioxide to more value added chems. including methanol. Finally, it also provides the scope for the future research on this topic with adequate literature support.

~2 Citings

9. Development of $\beta$-SiAlON based ceramics for radome applications

By Ganesh, Ibram

This paper is a review article covering various methods reported on synthesis of $\beta$-SiAlON based ceramic materials and on their net-shape consolidation into radome structures. It also identifies a compn. out of a wide-range $\beta$-Si6-zAlzOzN8-z (where z = 0-4.1) solid soln. suitable for radome applications and discusses about various efficient methods reported on fabrication of radome structures out of these compns. This article also covers the literature pertaining to $\beta$-SiAlON-SiO2 ceramic composites, which are considered to be materials of choice for certain high speed radome applications. Further, successful techniques employed for passivation of AlN powder against hydrolysis are also covered as this powder is one of the starting materials for both $\beta$-SiAlON and $\beta$-SiAlON-SiO2 ceramic composites. Surface passivation of AlN is necessary as it decomp. into alumina and ammonia, when it comes into contact with water during aq. processing of SiAlON based ceramics, thereby not permitting formation of desired SiAlON phase. Finally, the important properties of various com., radome materials together with those of $\beta$-SiAlON and $\beta$-SiAlON-SiO2 ceramic composites are also reviewed and presented in this article.

~0 Citings

10. Fabrication of magnesium aluminate (MgAl2O4) spinel foams

By Ganesh, Ibram

This paper reports on a novel-processing route for fabricating magnesium aluminate (MgAl2O4) spinel (MAS) foams from aq. suspensions contg. 30-35 vol.% solids loading. A stoichiometric MAS powder formed from alumina (71.8%) and magnesia (28.2%) at 1400 °C was surface passivated against hydrolysis in an ethanol soln. of H3PO4 and Al(H2PO4)3 at 80 °C for 24 h. Stable aq. suspensions with 30-35 vol.% solids loading were prepd. using the surface passivated MAS powder with the help of tetra-methylammonium hydroxide (TMAH) and an ammonium salt of polyacrylic acid (Duramax D-3005) employed as dispersing agents. An aq. soln. of N-cetyl-N,N,N-trimethylammonium bromide (CTMAB) was utilized to create foam in aq. MAS suspensions by mech. frothing. Liq. foam was then consolidated in non-porous molds by introducing a polyim. initiator and a catalyst under ambient conditions. Dried (at >90 °C for 24 h) MAS foams were then sintered for 1 h at 1650 °C. For comparison purposes, dense MAS bodies out of an un-passivated stoichiometric MAS powder, and, dense as well as foams out of alumina were also prepd. in this study. The sintered properties of MAS and alumina ceramics were characterized by various means and thus obtained results are presented and discussed in this paper. The sintered MAS foams exhibited a porosity of about 74-76% and a compressive strength of about 4-7.2 MPa in agreement with values reported for other ceramic foams in the literature.

~1 Citing

11. Fabrication of near net shape magnesium aluminate (MgAl2O4) spinel components via aqueous processing

By Ganesh, I.
From Advances in Applied Ceramics (2011), 110(8), 496-511. Language: English, Database: CAPLUS, DOI:10.1179/1743676110Y.0000000020
Net shape fabrication of magnesium aluminate (MgAl2O4) spinel (MAS) components like domes and radomes is of great importance because they are employed in certain important strategic applications. Environmentally and economically benign net-shape forming techniques such as aq. gelcasting (GC) and hydrolysis induced aq. gelcasting (GCHAS) cannot be employed to MAS powder as it reacts with water during processing and makes the process cumbersome. The processes reported in the literature to overcome this problem and for successful fabrication of net shape MAS components like thin wall radomes/crucibles following aq. colloidal processing routes such as GC and GCHAS are reviewed in this paper. This article also reviews the effect of surface treatment of MAS powder against hydrolysis and of consolidation route on net shape forming capability and the sintering ability of MAS powder. Furthermore, various other net shaping techniques reported for MAS are also reviewed in this article.

~0 Citings

12. Hydrolysis-induced aqueous gelcasting of magnesium aluminate spinel

By Ganesh, Ibram; Reddy, Gundala Jaganatha; Sundararajan, Govindan; Olhero, Susana M.; Torres, Paula M. C.; Ferreira, Jose M. F.

This paper reports on the synthesis of magnesium aluminate spinel (MAS) powders and consolidation of MAS ceramics by hydrolysis-induced aq. gelcasting (GCHAS). The MAS powders surface passivated against hydrolysis were dispersed in an aq.-org. premix soln. using suitable dispersants. The consolidation of green bodies occurred under ambient conditions by adding a polyn. initiator, a catalyst, and AlN (0-4.06 wt%) as a cosetting agent. Green samples with exceptionally high green strength (∼21 MPa) were obtained in the presence of 4.06 wt% AlN. Sintered (1650°C, 1 h) MAS ceramics consolidated by GCHAS exhibited mech. properties that are comparable to those consolidated by dry pressing.

~3 Citings

13. Influence of chemical composition on sintering ability of ZTA ceramics consolidated from freeze dried granules

By Ganesh, Ibram; Sundararajan, G.; Olhero, S. M.; Ferreira, J. M. F.

Dense zirconia-toughened alumina (ZTA) ceramic composites with ZrO2 = 0, 5, 10, 15, 20, 30, 60 and 100 wt.% have been prep. by sintering green compacts obtained by dry powder pressing of freeze dried granules consisting of α-alumina and a yttria partially stabilized zirconia (YPSZ) at various temps. ranging from 1450 to 1650 °C for 1-2 h. The characteristics of sintered products were detd. by X-ray diffraction (XRD), SEM, Archimedes principle, Vickers indentation method and by 3-point bend test. Characterization results revealed that adding YPSZ increased the 3-point bend (flexural) strength, fracture toughness and homogeneity of the microstructure, but slightly decreased the hardness and the sintering ability of alumina. A 20 wt.% YPSZ was sufficient to increase the fracture toughness and flexural strength of specimens sintered for 2 h at 1600 °C from 2.5 to 4.6 MPa.m1/2 and 150 to 400 MPa, resp. The XRD results revealed that there is no solid-soln. formation between zirconia and alumina constituents of ZTA ceramic composites upon sintering.

~1 Citing

14. Novel route to β-SiAlON-SiO2 ceramic composites

By Ganesh, I.; Sundararajan, G.

This paper reports a novel synthetic route to prep. dense β-SiAlON-SiO2 ceramic composites. The stoichiometric β-Si4Al2O2N6 extrudates prepd. by the reaction sintering of α-Si3N4, α-Al2O3, AlN and Y2O3 precursor mixt. at 1675°C for 4 h were fine ground and mixed with different amts. of com. fused silica (20, 40, 50, 60 and 80 wt.-%) powder, dry pressed and sintered for 3-4 h at 1500-1750°C. These sintered materials were thoroughly characterized for bulk d., apparent porosity, water absorption capacity, phase compn., microstructure, hardness, dielec. const. and coeff. of thermal expansion. These characterization results are presented and discussed in this paper.

~1 Citing
15. A novel colloidal processing route to alumina ceramics
By Ganesh, Ibram; Sundararajan, G.; Olhero, Susana M.; Torres, Paula M. C.; Ferreira, Jose M. F.
From Ceramics International (2010), 36(4), 1357-1364. Language: English, Database: CAPLUS, DOI:10.1016/j.ceramint.2010.01.022

The fabrication of complex-shaped alumina ceramics following a new near-net shape technique based on hydrolysis-induced aq. gelcasting (GCHAS) is reported. Aq. suspension contg. 50 vol.% solids loading was prepd. by dispersing alumina in an aq. soln. of methacrylamide and methylenebisacrylamide (17 wt.% in 6:1) using polycarboxylic acid as dispersing agent. Consolidation was accomplished by adding a polymn. initiator, a catalyst and AlN powder (4 wt.%). For comparison purposes, alumina ceramics were also consolidated by aq. gelcasting (GC) and by hydrolysis assisted solidification (HAS) from the same concd. suspensions, and by conventional dry pressing (DP) from freeze dried granules prepd. from the same suspensions by freeze granulation. Among the four shaping techniques used, GCHAS was found to be best for consolidating near-net shape alumina components like thin wall radomes with the highest green strength ever reported for alumina ceramics. Green samples were sintered for 2 h at 1600° and then characterized for microstructure and mech. properties.

~8 Citings

16. Hydrolysis-induced aqueous gelcasting of β-SiAlON-SiO2 ceramic composites: the effect of AlN additive
By Ganesh, Ibram; Sundararajan, Govindan

Dense β-SiAlON-SiO2 (SiO2 = 20, 40, 50, 60, and 80 wt.%) ceramic composites have been prepd. from β-Si4Al2O2N6 and fused silica by sintering at 1500-1750° for 3-4 h. For comparison purposes, a powder mixt. consisting 60 wt.% β-Si4Al2O2N6 and 40 wt.% fused silica has been consolidated following a new near-net shape technique based on hydrolysis-induced aq. gelcasting (GCHAS) and sintered for 3 h at 1750°. In the GCHAS process, consolidation of suspensions contg. 50 vol.% solids was achieved by adding a polymn. initiator, a catalyst, and AlN powder equiv. to 1-5 wt.% Al2O3. Thin-wall radomes consolidated by GCHAS (using AlN equiv. to 5 wt.% Al2O3 in the suspension) have exhibited green strengths >20 MPa. The sintered materials were characterized for various properties including hardness, fracture toughness, mass loss, shrinkage, coeff. of thermal expansion, and dielec. const. The Si2N2O formed from a powder mixt. of 60 wt.% β-Si4Al2O2N6 and 40 wt.% fused silica at 1750° for 3 h exhibited a flexural strength of ~140 MPa, Young's modulus of 214 GPa, coeff. of thermal expansion of 3.5 × 10-6 °C-1, hardness of 1390 kg/mm2, fracture toughness of 4.2 MPa/m1/2, and a dielec. const. of 5.896 and tan δ of 0.002 at 17 GHz.

~3 Citings

17. Influence of processing route on microstructure and mechanical properties of MgAl2O4 spinel
By Ganesh, Ibram; Jaganatha Reddy, G.; Sundararajan, G.; Olhero, Susana M.; Torres, Paula M. C.; Ferreira, Jose M. F.

This paper reports on process dependant microstructural and mech. properties of MgAl2O4 spinel (MAS) ceramics. Two MAS powders with different chem. comprns. were prepd. by solid-state reaction of alumina and calcined caustic magnesia at 1400° for 1 h. The surface of the as obtained MAS powders was passivated against hydrolysis by coating it with H3PO4 and Al(H2PO4)3 species dissolved in ethanol at 80° for 24 h. The as protected powders could then be dispersed in aq. solns. of tetramethylammonium hydroxide (TMAH) and Duramax D-3005 as dispersing agents to obtain stable slurries with 45 vol.% solids loading. The stable aq. MAS slurries were consolidated by slip casting (SC), gelcasting (GC), hydrolysis-assisted solidification (HAS), and hydrolysis-induced aq. gelcasting (GCHAS) routes, fully dried and then sintered for 1 h at 1650°. For comparison purposes, dense MAS ceramics were also prepd. following a conventional dry-powder pressing (DP) and temp.-induced gelation (TIG) routes. All the sintered MAS ceramics were thoroughly characterized for bulk d., apparent porosity, water absorption capacity, SEM microstructure, XRD phase, hardness, 3-point bend strength, and percentage of shrinkage to evaluate the suitability of the processing routes for fabricating defect-free components with near-net shape. Among the various techniques employed, the GCHAS was found to be best for fabricating near-net shape MAS ceramics.

~14 Citings
18. Characterization and photocatalytic activity of TiO2-MxOy (MxOy = SiO2, Al2O3, and ZrO2) mixed oxides synthesized by microwave-induced solution combustion technique

By Reddy, Benjaram M.; Reddy, Gunugunuri K.; Rao, Komateedi N.; Ganesh, Ibram; Ferreira, Jose M. F.

Titania-silica, titania-alumina, and titania-zirconia mixed oxides (1:1 molar ratio) were prepd. by a microwave-induced soln. combustion synthesis technique. The prepd. materials were characterized by TG/DTA, X-ray diffraction (XRD), Raman spectroscopy, BET surface area, XPS, UV-visible diffuse reflectance spectroscopic (UV-Vis DRS), and FTIR spectroscopy techniques to assess their physicochem. properties. Their photocatalytic activity for the degrdn. of phenol in aq. soln. under sunlight was studied. XRD and Raman studies revealed the presence of titania in the form of anatase phase in all the mixed oxides synthesized. The XRD studies further suggested that titania-zirconia contains an addnl. (Ti,Zr)O2 phase. UV-Vis DRS results reveal that all samples exhibit absorption maxima near visible region. FTIR results revealed the presence of Ti-O-Si linkages in the titania-silica sample, which are responsible for its higher activity in the photocatalytic degrdn. of phenol under sunlight.

~9 Citings

19. Densification ability of combustion-derived Al2O3 powders

By Ganesh, Ibram; Torres, Paula M. C.; Ferreira, J. M. F.

Nanocryst. Al2O3 powders contg. different amts. of MgO (0.1-5.0 mol%) or added boehmite (AlOOH) were prepd. by combustion synthesis from aluminum nitrate and magnesium nitrate, using urea or sucrose as fuels. The as-prepd. alumina powders were deagglomerated, compacted by dry pressing and sintered at 1625°C for 2 h. For comparison purposes, a com. high purity α-Al2O3 powder (ACC) was also processed following the same route. The sintered materials were characterized for bulk d. (BD), apparent porosity (AP), and water absorption (WA) capacity, microstructure using SEM, and XRD phase compn. In comparison to boehmite, the MgO had a considerable effect on the densification behavior of combustion-synthesized powder.

~7 Citings

20. Gelcasting of magnesium aluminate spinel powder

By Ganesh, Ibram; Olhero, Susana M.; Torres, Paula M. C.; Ferreira, Jose M. F.

A stoichiometric MgAl2O4 spinel (MAS) powder was processed in aq. media and consolidated by gelcasting from suspensions contg. 41-45 vol% solids loading. The MAS powder was first obtained by heat treating a compacted mixt. of α-Al2O3 and calcined caustic MgO at 1400°C for 1 h, followed by crushing and milling. Then, its surface was passivated against hydrolysis using an ethanol soln. of H3PO4 and Al(H2PO4)3. The as-treated surface MAS powder could then be dispersed in water using tetra Me ammonium hydroxide and an ammonium salt of poly-acrylic acid (Duramax D-3005) as dispersing agents. The as-obtained stable suspensions were gelcast, dried, and sintered at 1650°C for 1-3 h. For comparison purposes, the treated powder was also compacted by die pressing of freeze-dried granules and sintered along with gelcast samples. Near-net-shape MAS components with 99.55% of the theor. d. could be fabricated by aq. gelcasting upon sintering at 1650°C for 3 h. The MAS ceramics fabricated by gelcasting and die pressing exhibited comparable properties.

~10 Citings

21. Hydrolysis-induced aqueous gelcasting for near-net shape forming of ZTA ceramic composites

By Ganesh, Ibram; Olhero, Susana M.; Torres, Paula M. C.; Alves, Fernando J.; Ferreira, Jose M. F.
A new near-net shape forming process called "hydrolysis-induced aq. gelcasting" (GCHAS) is reported for the consolidation of ZTA composites, ZTA-30 (70 wt.% Al2O3 + 30 wt.% ZrO2) and ZTA-60 (40 wt.% Al2O3 + 60 wt.% ZrO2). For comparison purposes, ceramics having the same chem. comps. were also consolidated by hydrolysis-assisted solidification (HAS). All the starting suspensions contained a solids loading of 50 vol.%. In the precursor powder mixts., 1-5 wt.% of Al2O3 was replaced by equiv. amts. of AlN to enhance or promote or co-promote the consolidation of suspensions by HAS or by GCHAS, resp. The suspensions for GCHAS were prepd. by dispersing the ZTA powder precursor mixts. in a premix soln. of 20 wt.% MAM (methacrylamide), MBAM (methylenebisacrylamide), and NVP (N-vinylpyrrolidinone) in 3:1:3 ratio in de-ionized water. Ceramics consolidated via GCHAS exhibited superior mech. properties after consolidation and after sintering for 1 h at 1600° in comparison to those consolidated by HAS.

~12 Citings

22. Influence of raw material type and of the overall chemical composition on phase formation and sintered microstructure of Mullite aggregates

By Ganesh, Ibram; Ferreira, Jose M. F.

Dense mullite aggregates with varied (47-70%) alumina contents have been prepd. by a conventional dry-powder pressing technique followed by heat treatments at temps. in the range of 1450-1725°. Different types of clays, beach sand sillimanite (BSS) and a high purity aluminum hydroxide were used as starting materials. Mullites derived from BSS consisted of equi-axed grains whereas those obtained from clay contg. precursor mixts. exhibited elongated grains. The bulk d. (BD), apparent porosity (AP) and water absorption (WA) capacity of sintered mullites were found to be strongly influenced by the pre-mullitization step of the precursors and in a less extent by the type of raw material, its hydration degree and the impurity contents of Fe2O3, CaO, and Na2O. Mullite aggregates obtained from the three different types of aluminosilicate raw materials (i.e., ball clay, china clay and beach sand sillimanite) through a double-stage heat treatment process exhibited better sintered properties in terms of bulk d., apparent porosity, water absorption capacity and higher mullite contents in comparison to those obtained following a single-stage firing process.

~4 Citings

23. Microwave-assisted Synthesis and Structural Characterization of Nanosized Ce0.5Zr0.5O2 for CO Oxidation

By Reddy, Benjaram M.; Reddy, Gunugunuri K.; Ganesh, Ibram; Ferreira, Jose M. F.

Nanosized Ce0.5Zr0.5O2 solid soln. has been synthesized by microwave-induced soln. combustion method (MWCZ) and compared with that of a CexZr1-xO2 solid soln. with the same compn. but prepd. by the conventional copptn. method (CPCZ) and calcined at 773 K. X-ray diffraction and cell parameter studies revealed the incorporation of more zirconia and formation of more defect sites in the ceria lattice of the material prepd. by microwave method. Raman spectroscopic measurements suggested the presence of oxygen vacancies, lattice defects and displacement of oxygen ions from their ideal lattice positions. X-ray photo electron spectroscopic studies indicated a high reducibility and surface enrichment of Ce3+ ions in the MWCZ sample. Better oxygen storage capacity and CO oxidn. activity was obsd. for MWCZ in comparison to that of CPCZ sample. The significance of the microwave method lies mainly in its simplicity, flexibility, and easy control of different factors that det. the activity of the mixed oxide.

~2 Citings

24. Near-net shape β-Si4Al2O2N6 parts by hydrolysis induced aqueous gelcasting process

By Ganesh, Ibram

A new net-shaping process, an hydrolysis-induced aq. gelcasting (GCHAS) is reported for consolidation of β-Si4Al2O2N6 ceramics from aq. slurries contg. 48-50 vol% α-Si3N4, α-Al2O3, AlN, and Y2O3 powders mixt. Dense ceramics of same compn. were also consolidated by aq. GC and hydrolysis-assisted solidification routes. Among 3 techniques used, the GCHAS process was found to be superior for fabricating defect-free thin wall β-Si4Al2O2N6 crucibles and tubes. Before use, the as purchased AlN powder was passivated against hydrolysis. The sintered β-Si4Al2O2N6 ceramics exhibited comparable properties with those reported for similar materials in the literature.
25. Phosphoric acid treated AlN powder for aqueous processing of net-shape dense AlN and $\beta$-SiAlON parts

By Ganesh, I.; Olhero, S. M.; Ferreira, J. M. F.


Due to fast hydrolysis of AlN when in contact with water, AlN-based ceramics are processed in org. solvents, which are volatile, expensive, harmful to the health and environment. The present work intends to protect AlN powder against hydrolysis to enable aq. processing of AlN based ceramics. A com. AlN powder was treated in an ethanol soln. of H$_3$PO$_4$ and Al(H$_2$PO$_4$)$_3$ kept at 80°C for 24 h to protect it from hydrolysis. The dispersing behavior of the treated AlN powder in water and the ability to consolidate defect free parts of AlN and $\beta$-Si$_4$Al$_2$O$_2$N$_6$ ceramics from aq. suspensions by slip casting and gelcasting techniques were studied. The consolidated parts were then sintered in a graphite furnace and the sintered bodies exhibited properties [bulk d. (BD), apparent porosity (AP), cryst. phase compn., and microstructural features] similar to those reported in literature for the same materials processed from org. media.

~4 Citings

26. Single step synthesis of nanosized CeO$_2$-MxO$_y$ mixed oxides (MxO$_y$ = SiO$_2$, TiO$_2$, ZrO$_2$, and Al$_2$O$_3$) by microwave induced solution combustion synthesis: characterization and CO oxidation

By Reddy, Benjaram M.; Reddy, Gunugunuri K.; Ganesh, Ibram; Ferreira, Jose M. F.


Various CeO$_2$-MxO$_y$ (MxO$_y$ = SiO$_2$, TiO$_2$, ZrO$_2$, and Al$_2$O$_3$) mixed oxides were prepd. by microwave induced soln. combustion method and analyzed by different complimentary techniques, namely, X-ray diffraction (XRD), Raman spectroscopic (RS), UV-Vis diffuse reflectance spectroscopy (UV-DRS), XPS, thermogravimetry (TG-DTA), and BET surface area. XRD analyses revealed that CeO$_2$-SiO$_2$ and CeO$_2$-TiO$_2$ mixed oxides are in slightly amorphous form and exhibit only broad diffraction lines due to cubic fluorite structure of ceria. XRD lines due to the formation of cubic Ce$_0.5$Zr$_0.5$O$_2$ were obsd. in the case of CeO$_2$-ZrO$_2$ sample. RS results suggested defective structure of the mixed oxides resulting in the formation of oxygen vacancies. The UV-DRS measurements provided valid information about Ce$^{4+}$ O$_2$- and Ce$^{3+}$ O$_2$- charge transfer transitions. XPS studies revealed the presence of cerium in both Ce$^{3+}$ and Ce$^{4+}$ oxidn. states. The ceria-zirconia combination exhibited better oxygen storage capacity (OSC) and CO oxidn. activity when compared to other samples. The significance of present synthesis method lays mostly on its simplicity, flexibility, and the easy control of different exptl. factors.

~10 Citings

27. Synthesis and characterization of MgAl$_2$O$_4$-ZrO$_2$ composites

By Ganesh, Ibram; Ferreira, J. M. F.


Different types of dense 5-97% ZrO$_2$-MgAl$_2$O$_4$ composites were prepd. using a MgAl$_2$O$_4$ spinel obtained by calcining a stoichiometric mixt. of Al(OH)$_3$ and caustic MgO at 1300° for 1 h, and a com. yttria partially stabilized zirconia (YPSZ) powder as starting raw materials by sintering at various temps. ranging from 1500 to 1650° for 2 h. The characteristics of the MgAl$_2$O$_4$ spinel, the YPSZ powder and the various sintered products were detd. by x-ray diffraction, SEM, BET surface area, particle size anal., Archimedes principle, and Vickers indentation method. Characterization results revealed that the YPSZ addn. increases the sintering ability, fracture toughness, and hardness of MgAl$_2$O$_4$ spinel, whereas, the MgAl$_2$O$_4$ spinel hampered the sintering ability of YPSZ when sintered at elevated temps. A 20-wt.% YPSZ was found to be sufficient to increase the hardness and fracture toughness of MgAl$_2$O$_4$ spinel from 406 to 1314 Hv and 2.5 to 3.45 MPa m$^{1/2}$, resp., when sintered at 1600° for 2 h.

~9 Citings
28. Synthesis of nanosized ceria-zirconia solid solutions by a rapid microwave-assisted combustion method

By Reddy, Benjaram M.; Reddy, Gunugunuri K.; Reddy, Lankela H.; Ganesh, Ibram
From Open Physical Chemistry Journal (2009), 3, 24-29. Language: English. Database: CAPLUS,
DOI:10.2174/1874067700903010024

By adopting a simple cost effective microwave-assisted synthesis methodol., nanosized ceria-zirconia solid soln. (MW) has been prepd. For comparison purpose, ceria-zirconia solid soln. with the same compn. was also synthesized by a copptn. method (CP) and calcined at 773 K. Both the samples were examd. by different characterization techniques namely, X-ray diffraction, Raman spectroscopy, XPS, transmission electron microscopy, BET surface area and other methods, and evaluated for CO oxidn. activity. XRD studies revealed formation of monophasic Ce0.5Zr0.5O2 solid soln. in the MW sample and Ce0.75Zr0.25O2 solid soln. in the CP sample. TEM studies showed the presence of nanometer sized particles with broad particle size distribution in the sample prepd. by microwave method. Raman spectroscopy and oxygen storage capacity measurements suggested the presence of more oxygen vacancies and lattice defects in the MW sample. XPS studies indicated a high reducibility and surface enrichment of Ce3+ ions in the MW sample. Higher CO oxidn. activity and lower light off temp. was obsd. for the microwave synthesized sample in comparison to that of copptd. sample.

~4 Citings

29. A non-aqueous processing route for phosphate-protection of AlN powder against hydrolysis

By Ganesh, I.; Thiyagarajan, N.; Sundararajan, G.; Olhero, S. M.; Ferreira, J. M. F.
From Journal of the European Ceramic Society (2008), 28(11), 2281-2288. Language: English. Database: CAPLUS,
DOI:10.1016/j.jeurceramsoc.2008.02.025

A com. AlN powder was treated in an ethanol with H3PO4 and Al(H2PO4)3 to passivate its surface against hydrolysis. The treated powder was quite stable in water for >72 h as confirmed by pH measurement, x-ray diffraction, Fourier transform IR spectroscopy, SEM, and energy dispersive anal. with x-rays. The coating layer was stable ≤1200° as confirmed by thermogravimetry and DTA. The aq. processing ability of treated AlN powder was tested in aq. gelcasting of β-SiAlON reaction precursor mixts. for fabricating dense ceramic bodies and 500 mL thin wall crucibles. The sintered gelcast β-SiAlON exhibited the following properties: bulk d. of 3.07 g/cm3, apparent porosity of 0.13%, water absorption capacity of 0.04%, linear shrinkage of <16%, β-SiAlON content of >90%, hardness of 14 GPa and fracture toughness of 3.95 MPa m1/2.

~5 Citings

30. An aqueous gelcasting route to dense β-Si4Al2O2N6-0.5SiO2 ceramics

By Ganesh, I.; Thiyagarajan, N.; Jana, D. C.; Barik, P.; Sundararajan, G.
From Journal of the American Ceramic Society (2008), 91(5), 1566-1571. Language: English. Database: CAPLUS,
DOI:10.1111/j.1551-2916.2008.02316.x

Aq. particulate slurries contg. 45-50 vol% α-Si3N4, α-Al2O3, and Y2O3 powder mixts. were gel-cast and sintered for 2-4 h at 1675-1800°C to obtain dense β-Si4Al2O2N6-0.5SiO2 ceramics. For comparison, dense ceramics of the same compn., together with a stoichiometric β-Si4Al2O2N6, were also prepd. following a conventional dry-powder pressing route. The sintered materials were thoroughly characterized for bulk d., apparent porosity, water- absorption capacity, X-ray diffraction phase, microstructure, hardness, fracture toughness, coeff. of thermal expansion (CTE), and dielec. const. at 16-18 GHz frequency. The characterization results suggest that the sintered properties of β-Si4Al2O2N6-0.5SiO2 are little influenced by the processing route, and the in situ generated SiO2 was found to reduce the CTE and dielec. const. of β-Si4Al2O2N6 considerably. An aq. particulate slurry contg. a 48 vol% β-Si4Al2O2N6-0.5SiO2 precursor mixt. was successfully gel-cast in an indigenously designed and fabricated aluminum mold to fabricate defect-free crucibles of 500 mL vol. The gel-cast β-Si4Al2O2N6-0.5SiO2 obtained from a slurry contg. 48 vol% solids exhibited a bulk d. of 3.13 g/cm3, a β-SiAlON phase of ∼90%, a CTE of 3.197 × 10-6 °C-1 (between 30° and 1000°C), a fracture toughness of −3.42 MPa·m1/2, a three-point bend strength of −199 MPa, and a dielec. const. of −6.32 at 17 GHz frequency after sintering for 4 h at 1750°C with 7 wt.% Y2O3.

~10 Citings

31. Aqueous colloidal processing of ZTA composites

By Olhero, Susana M.; Ganesh, Ibram; Torres, Paula M. C.; Alves, Fernando J.; Ferreira, Jose M. F.
From Journal of the American Ceramic Society (2008), 92(1), 9-16. Language: English. Database: CAPLUS,
DOI:10.1111/j.1551-2916.2008.02823.x

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Two different zirconia-alumina composites, ZTA-30 (70 wt% Al2O3 + 30 wt% ZrO2) and ZTA-60 (40 wt% Al2O3 + 60 wt% ZrO2), with potential for orthopedic applications, were processed in aq. media and consolidated by slip casting (SC), hydrolysis-assisted solidification (HAS), and gelcasting (GC) from suspensions contg. 50 vol% solids loading. For comparison purposes, the same ceramic compns. were also consolidated by die pressing of freeze-dried granules (FG). In the HAS process, 5 wt% of Al2O3 in the precursor mixt. was replaced by equiv. amts. of AlN to promote the consolidation of the suspensions. Ceramics consolidated via GC exhibited higher green (three-point bend) strengths (~17 MPa) than those consolidated by other techniques. Further, these ceramics also exhibited superior fracture toughness and flexural strength properties after sintering for 1 h at 1600°C in comparison with those consolidated by other techniques, including conventional die pressing (FG).

~7 Citings

32. Aqueous gelcasting process for β-Si4Al2O2N6 ceramics
By Ganesh, Ibram; Thiyagarajan, Natarajan; Jana, Dulal C.; Mahajan, Yashwant R.; Sundararajan, Govindan
Dense β-Si4Al2O2N6 ceramics were obtained from α-Si3N4, α-Al2O3, AlN, and Y2O3 upon sintering (for 4 h at 1675°C) green bodies consolidated by an aq. gelcasting and a conventional dry-powder processing route. The as-purchased AlN powder was treated with H3PO4 and Al(H2PO4)3 and dispersed in aq.-org. premix soln. along with α-Si3N4, α-Al2O3, and Y2O3 powder with the help of a com. amino alc.-based cationic (Dolapix A88) dispersing agent to obtain suspensions with 45-50 vol% solids loading for gelcasting purpose. The gelcast β-Si4Al2O2N6 exhibited superior hardness (1423 ± 6 Hv), fracture toughness (3.95 ± 0.3 MPa·m1/2), and coeff. of thermal expansion (3.798 × 10-6/°C between 30° and 1000°C) in comparison with the ceramic consolidated by conventional dry-powder pressing route, which exhibited only 1317 ± 5 Hv, 3.30 ± 0.2 MPa·m1/2 and 3.532 × 10-6/°C between 30° and 700°C.

~6 Citings

33. Chemisorption of Phosphoric Acid and Surface Characterization of As Passivated AlN Powder Against Hydrolysis
By Ganesh, Ibram; Olhero, Susana M.; Araujo, Aurora B.; Correia, Maria R.; Sundararajan, Govindan; Ferreira, Jose M. F.
By simply refluxing a com. AlN powder in a mixt. soln. of EtOH, H3PO4, and Al(H2PO4)3 for 24 h at 80°, the powder was successfully passivated against hydrolysis. The phosphate layer formed on the surface of AlN powder is quite stable toward protecting the powder from hydrolysis. The efficacy of the coating was established by suspending the treated and the untreated powders in H2O for 72 h and subsequently characterizing them by XRD, FTIR, XPS, TEM, and Raman anal. The good dispersing behavior of the treated AlN powder in H2O was confirmed by the low viscosity of an AlN suspension contg. 50 vol.% solids demonstrating the viability of replacing org. solvents by H2O in colloidal processing of AlN-based ceramics.

~8 Citings

34. Chemisorption of phosphoric acid and surface characterization of As passivated AlN powder against hydrolysis
By Ganesh Ibram; Olhero Susana M; Araujo Aurora B; Correia Maria R; Sundararajan Govindan; Ferreira Jose M F
By simply refluxing a commercial AlN powder in a mixture solution of ethanol, H(3)PO(4), and Al(H(2)PO(4))(3) for 24 h at 80 degrees C, the powder was successfully passivated against hydrolysis. The phosphate layer formed on the surface of AlN powder was found to be quite stable toward protecting the powder from hydrolysis. The efficacy of the coating was established by suspending the treated and the untreated powders in water for 72 h and subsequently characterizing them by X-ray diffraction (XRD), Fourier transform infrared (FT-IR), X-ray photoelectron spectroscopy (XPS), transmission electron microscopy (TEM), and Raman analysis. The good dispersing behavior of the treated AlN powder in water was confirmed by the low viscosity of an AlN suspension containing 50 vol.% solids demonstrating the viability of replacing organic solvents by water in colloidal processing of AlN-based ceramics.

~0 Citings

35. Dense β-SiAlONs consolidated by a modified hydrolysis-assisted solidification route
By Ganesh, Ibram; Thiyagarajan, N.; Jana, D. C.; Barick, P.; Sundararajan, G.; Ferreira, J. M. F.
Dense β-Si4Al2O2N6 materials were fabricated by a modified hydrolysis-assisted solidification (HAS) route from aq. slurries contg. 46-50 vol.% solids, in which 5-22 wt.% of the required α-Al2O3 was replaced by equiv. amts. of unprotected (AlN) powder to promote consolidation via AlN hydrolysis. A fixed amt. (9.37 wt.%) of AlN passivated against hydrolysis with a coating phosphate layer was also added to all the samples consolidated by the modified HAS method. The aq. slurries were cast in non-porous molds, allowed to set and dried before sintering at 1675° for 4 h. For comparison purposes, ceramics with the same predicted final compn. (having 64.33% α-Si3N4, 23.36% α-Al2O3, 9.37% AlN, and 7% Y2O3 as starting materials) were also consolidated by a conventional dry-powder pressing (CDPP). The β-Si4Al2O2N6 ceramics consolidated by the modified HAS route exhibited superior outstanding properties (bulk d., apparent porosity, water absorption capacity, hardness, and fracture toughness) in comparison to the traditional dry-powder pressing route.

~19 Citings

36. Formation and densification behavior of MgAl2O4 spinel: the influence of processing parameters
By Ganesh, Ibram; Olhero, Susana M.; Rebelo, Avito H.; Ferreira, J. M. F.
Different types of dense stoichiometric and nonstoichiometric magnesium aluminate (MgAl2O4) spinel (MAS) ceramics were prep. following a conventional double-stage firing process using different com. available alumina and magnesia raw materials. Stoichiometric, magnesia-rich, and alumina-rich spinels were sintered at 1500-1800°C for 1-2.5 h. The influence of the different processing parameters (av. particle size, degree of spinel phase, green d., mass of the powder compact, sintering temp., holding time at the peak temp., and starting compn.) on the densification behavior of MAS was assessed by measuring the bulk d., apparent porosity, and water absorption capacity, and microstructural observations. Most of the MAS compns. tested exhibited excellent sintering properties.

~10 Citings

37. Formation and densification behavior of mullite aggregates from beach sand sillimanite
By Ganesh, Ibram; Sundararajan, Govindan; Ferreira, Jose M. F.
Dense mullite aggregates with 60% and 70% Al2O3 have been prep. from precursor mixts. consisting of beach sand sillimanite (50-60% Al2O3) and a high-purity aluminum hydroxide following conventional single- and double-stage firing processes. The bulk d. (BD), apparent porosity (AP), and water absorption (WA) capacity of sintered mullite aggregates were found to be strongly influenced by the premullitization step of this precursor mixt. Mullite aggregates formed in a double-stage firing process exhibited higher BD and mullite content and lower AP and WA capacity in comparison with those obtained by the single-stage firing process. The values of coeff. of thermal expansion of sintered mullite aggregates are close to those found in the literature reports for high-purity stoichiometric mullite.

~0 Citings
38. Influence of chemical composition and Y2O3 on sinterability, dielectric constant, and CTE of β-SiAlON

By Ganesh, Ibram; Thiyagarajan, Natarajan; Jana, Dulal Chandra; Mahajan, Yashwant Ramachandra; Sundararajan, Govindan


Different types of dense β-Si₆₋ₓAlₓOₓN₈₋ₓ (z = 1, 1.5, 2, 2.5, 3, 3.5, and 4) ceramics have been prepd. following a conventional reaction sintering process at 1675-1700°C using α-Si₃N₄, α-Al₂O₃, AlN, and 3-7 wt% Y2O₃ as raw materials. Sintered materials were thoroughly characterized for bulk d. (BD), apparent porosity (AP), water absorption (WA) capacity, phase formation, microstructure, coeff. of thermal expansion (CTE), hardness, fracture toughness, three-point bending strength, and dielec. const. at 16-18 GHz frequency. Characterization results suggest that an increase in z value, Y2O₃ concn., and sintering temp. leads to an increase in β-Sialon phase formation, BD, grain size, fracture toughness, and dielec. const., and as a consequence, AP, WA capacity, hardness, and three-point bend strength of the materials decrease. These materials also exhibited stable and low dielec. consts. (5.67-7.67) between 16 and 18 GHz frequency. The β-Si₄Al₂O₆N₆ exhibited a BD of ∼3.06 g/mL, AP of ∼0.01%, WA capacity of ∼0.01%, ∼94.43% β-SiAlON phase, a hardness of ∼1317 kg/mm², a fracture toughness of ∼3.30 MPa·m¹/², a three-point bend strength of ∼226 MPa, a CTE of 3.628 × 10⁻⁶°C⁻¹ between 30° and 700°C, and a dielec. const. of ∼7.206 at 17 GHz after sintering at 1675°C for 4 h with 7 wt% Y2O₃ addn.

~13 Citings

39. Influence of processing route and SiO2 on sintering ability, CTE, and dielectric constant of β-Si4Al2O2N6

By Ganesh, Ibram; Thiyagarajan, N.; Jana, D. C.; Sundararajan, G.; Olhero, S. M.; Ferreira, J. M. F.


Dense β-Si₄Al₂O₂N₆ and β-Si₄Al₂O₂N₆-0.5SiO₂ ceramics were obtained from α-Si₃N₄, α-Al₂O₃, AlN, and Y₂O₃ upon sintering green bodies consolidated by aq. gel casting. For comparison purposes, a β-Si₄Al₂O₂N₆ was also prepd. by the conventional dry-powder processing route. In the case of gel-cast β-Si₄Al₂O₂N₆, the as-purchased AlN powder was treated with H₃PO₄ and Al(H₂PO₄)₃ prior to use along with α-Si₃N₄, α-Al₂O₃, and Y₂O₃. The gel-cast β-Si₄Al₂O₂N₆ exhibited superior hardness (1423 ±6 Hv), fracture toughness (3.95 ±0.3 MPa·m¹/²), and coeff. of thermal expansion (CTE) (3.798 × 10⁻⁶/°C between 30 and 1000°C) in comparison to the ceramic consolidated by conventional dry pressing, which exhibited only 1317 ±5 Hv, 3.30 ±0.2 MPa·m¹/², and 3.532 × 10⁻⁶/°C between 30 and 700°C. The in situ-generated ∼9 wt% SiO₂ has considerably reduced the dielec. const. and CTE of β-Si₄Al₂O₂N₆ from 7.30 to 6.32 and from 3.798 × 10⁻⁶/°C to 3.519 × 10⁻⁶/°C, resp. The loss tangent property of the investigated materials was little influenced by the variation of chem. compn. and processing route.

~1 Citing

40. Surface oxidation and dispersion behavior of phenolic resin coated α-SiC powder in aqueous medium

By Ganesh, I.

From Advances in Applied Ceramics (2008), 107(4), 210-216. Language: English, Database: CAPLUS, DOI:10.1179/174367608X263368

The surface oxidn. and dispersion behavior of phenolic resin coated α-SiC powder in aq. medium has been studied. For comparison purpose a pure α-SiC powder was also studied. Zeta potential and viscosity studies revealed that the phenolic resin coated SiC powder requires an electrostatic stabilization, whereas, the pure SiC powder requires an electrosteric stabilization in order to produce aq. SiC slurries with high solids content. The decompn. behavior of phenolic resin was assessed by differential scanning calorimetry and thermogravimetry techniques. The influence of aq. processing on the surface characteristics of pure and the phenolic resin coated powders was assessed by means of Fourier transform IR spectroscopy and by estg. the bulk d. of their gel cast samples sintered at 2150° for 1 h. Various characterization results revealed that the phenolic resin coating slightly effects the dispersion behavior of SiC powder in the aq. medium but it protects powder from surface oxidn. during aq. processing. Sintered properties suggest that in order to obtain a dense SiC body with a bulk d. of >3.13 g cm⁻³ (~97.5% of the theor. d.) following an aq. gel-casting technique, the phenolic resin (~5%) coated SiC powder should possess an av. particle/agglomerate size of <11 µ, compact (green) d. of >1.67 g cm⁻³ and B content of >0.5%.

~3 Citings
41. Surface Passivation of MgAl2O4 Spinel Powder by Chemisorbing H3PO4 for Easy Aqueous Processing

By Olhero, Susana M.; Ganesh, Ibram; Torres, Paula M. C.; Ferreira, Jose M. F.
From Langmuir (2008), 24(17), 9525-9530. Language: English, Database: CAPLUS, DOI:10.1021/la801300m

A stoichiometric MgAl2O4 spinel (MAS) powder was synthesized by heat treating at 1400 °C for 2 h a compacted mixt. of α-Al2O3 and calcined caustic MgO, followed by crushing and milling. The surface of this powder was then passivated against hydrolysis with H3PO4 and Al(H2PO4)3 in an ethanol soln. The as-passivated powder could then be dispersed in water using tetramethylammonium hydroxide (TMAH) and an ammonium salt of poly(acrylic acid) (Duramax D-3005) as dispersing agents and gelcast to form green consolidates with relatively high strength (>15 MPa). The good dispersing behavior of the passivated powder in water was confirmed by the low viscosity of its suspension containing 41-45 vol% solids, demonstrating the viability of replacing org. solvents by water in colloidal processing of MAS-based ceramics. FTIR spectroscopy, X-ray diffraction (XRD), and energy dispersive X-ray (EDAX) studies revealed that only negligible amounts of phosphate ions at the surface are required to effectively protect the powder from reacting with water.

~7 Citings

42. Surface passivation of MgAl2O4 spinel powder by chemisorbing H3PO4 for easy aqueous processing

By Olhero Susana M; Ganesh Ibram; Torres Paula M C; Ferreira Jose M F

A stoichiometric MgAl 2O 4 spinel (MAS) powder was synthesized by heat treating at 1400 degrees C for 2 h a compacted mixture of alpha-Al 2O 3 and calcined caustic MgO, followed by crushing and milling. The surface of this powder was then passivated against hydrolysis with H 3PO 4 and Al(H 2PO 4) 3 in an ethanol solution. The as-passivated powder could then be dispersed in water using tetramethylammonium hydroxide (TMAH) and an ammonium salt of poly(acrylic acid) (Duramax D-3005) as dispersing agents and gelcast to form green consolidates with relatively high strength (>15 MPa). The good dispersing behavior of the passivated powder in water was confirmed by the low viscosity of its suspension containing 41-45 vol % solids, demonstrating the viability of replacing organic solvents by water in colloidal processing of MAS-based ceramics. The Fourier transform infrared (FT-IR), X-ray diffraction (XRD), and energy dispersive X-ray (EDAX) studies revealed that only negligible amounts of phosphate ions at the surface are required to effectively protect the powder from reacting with water.

~0 Citings

43. A process for the production of dense magnesium aluminate spinel grains

By Ganesh; Ibram
From Indian (2007), IN 198208 A1 20070223, Language: English, Database: CAPLUS

A process for the prodn. of dense stoichiometric MgAl2O4 grains having bulk d. of >3.30 g/cc, apparent porosity of <2.2% and water absorption of <1.0%, from aluminum tri-hydroxide produced by the Bayer process and seawater magnesia, using halides of ileac group elements as sintering aids is disclosed in this process. A method disclosed in the process is involved two stages firing, in which initially a mixt. contg. requisite quantities of magnesia and alumna raw materials claimed at <1600 K and subsequently sintering at <1873 K by adding AlCl3 as a new sintering additive. MgAl2O4 dense grains produced by this method are useful as refractory additives in burning and transition zones of cement rotary kilns and constables for steel ladles. The new sintering additive AlCl3 pyrohydrolyze at temps. >873 K in the air and converts into one of the constituents of the spinal body without contaminating original component. Sintering aid used in this method also helps in removing the Na2O present as impurity, by converting it into a volatile compd. at temp. >1773 K.
44. An improved method for making honeycomb extrusion die and a process for producing ceramic honeycomb structures using the said die

By Ganesh, Ibram
From Indian (2007), IN 198045 A1 20070223, Language: English, Database: CAPLUS

The invention disclosed relates to a process for forming oxide based dense ceramic composite coatings on reactive metal and alloy bodies. The process involves suspension of at least two reactive metal or alloy bodies in a special chamber through which the electrolyte is continuously circulated. Thyristor controlled, modified shaped wave multiphase a.c. power supply is applied across the said bodies and applied elec. current is slowly increased to till the required c.d. is achieved and then maintained const. throughout the process. Elec. potential is further increased gradually to compensate increased resistance of the coating. Thickness of the coating formed on the said bodies is monitored by the time for which above process is continued. The invention also relates to an app. for carrying out the above-defined process. The coatings obtained according to the present invention are found to exhibit higher d. and excellent wear resistance.

45. Influence of phase composition on sintered microstructure of combustion synthesized oxides

By Ganesh, Ibram; Ferreira, J. M. F.

The effects of powders synthesis methods (urea-combustion synthesis (CS) and conventional solid-state (SS) reaction) on the sintering ability, microstructural features, and mech. properties of Al2O3, MgAl2O4 spinel, and 20 wt.% ZrO2-MgAl2O4 upon sintering at 1625° were investigated. X-ray diffraction (XRD), SEM, relative d. (RD), apparent porosity and water absorption capacity, hardness, fracture toughness, and three-point bend test studies revealed the superior sintering ability of CS ZrO2-MgAl2O4 composite powder as compared with one prepd. by SS reaction. In contrast, single-phase powders obtained by SS reaction exhibit superior sintering ability over CS synthesized ones. The reasons for differences obsd. are discussed along this paper.

46. Preparation of a mixed oxide catalyst useful for condensation reactions

By Reddy, Benjaram Mahipal; Ganesh, Ibram; Chowdhury, Biswajit; Reddy, Vangala Ranga

A process for the prepn. of catalysts useful for the condensation reactions comprises: the co-pptn. of mixed oxides together with a support by a homogeneous deposition pptn. method and drying the obtained materials at 383 to 403 K and calcining it at 673 to 973 K, optionally treating with promoter metal oxides / hydroxides followed by drying and calcination by conventional method to get the catalyst. This method thus results in the prepn. of the active catalyst possessing high surface area, nano sized particles, homogeneous in structure, and uniform throughout bulk. The resulting catalysts exhibit high activity and selectivity for condensation reactions. A CuO-ZnO-Al2O3 catalyst was used to convert aniline and glycerol to quinoline.

47. Silica supported transition metal-based bimetallic catalysts for vapor phase selective hydrogenation of furfuraldehyde

By Reddy, Benjaram M.; Reddy, Gunugunuri K.; Rao, Komateedi N.; Khan, Ataullah; Ganesh, Ibram
A series of silica supported transition metal-based bimetallic catalysts M-M1/SiO2 (M = Co, Ni, and Cu; M1 = Ni, Cu, and Co) were prepared by deposition precipitation method. Nitrate salts of the corresponding transition metals and colloidal silica were used as precursors. The physicochemical characteristics of the prepared catalysts were investigated by means of X-ray diffraction, thermogravimetry, FT-IR, SEM-energy dispersive X-ray analysis, and BET surface area techniques. These catalysts were evaluated for selective hydrogenation of furfuraldehyde to furfuryl alcohol in the vapor phase at 423-523 K under normal atmospheric pressure. The XRD measurements reveal formation of a specific solid solution in the case of Cu-Co/SiO2 and Co-Ni/SiO2 catalysts. However, in the case of Cu-Ni/SiO2 catalyst only peaks due to CuO and NiO oxides were observed. The SEM measurements suggest that the prepared bimetallic catalysts are in a highly dispersed form over the surface of the colloidal silica support. Among various catalysts investigated, the Cu-Co/SiO2 and Ni-Cu/SiO2 combination catalysts exhibited a high conversion at 523 K and maximum product selectivity at 473 K.

~20 Citings

48. Synthesis of monophasic Ce0.5Zr0.5O2 solid solution by microwave-induced combustion method

By Reddy, Benjaram M.; Reddy, Gunugunuri K.; Khan, Ataullah; Ganesh, Ibram

Nanocrystalline monophasic Ce0.5Zr0.5O2 solid solution (1:1 molar ratio) has been synthesized by microwave-induced combustion method in a modified domestic microwave oven (2.45 GHz, 700 W) in approximately 40 min from cerium nitrate and zirconium nitrate precursors using urea as ignition fuel. For the purpose of better comparison, a CexZr1-xO2 solid solution (1:1 molar ratio) was also synthesized by a conventional coprecipitation method from nitrate precursors and subjected to different calcination temperatures. The synthesized powders of both methods were characterized by means of X-ray powder diffraction, thermogravimetry/DTA, SEM, and BET surface area techniques. Oxygen storage capacity (OSC) measurements were performed to understand the usefulness of these materials for various applications. The characterization results reveal that the sample obtained by microwave-induced combustion-synthesis route exhibits homogeneous monophasic Ce0.5Zr0.5O2 solid solution, whereas the co-precipitated sample displays compositional heterogeneity. The OSC measurements reveal that the materials synthesized by both methods exhibit comparable oxygen vacancy content (δ).

~7 Citings

49. A process for preparing ceramic crucibles

By Saha, Bhaskar Prasad; Johnson, Roy; Ganesh, Ibram; Bhattacharjee, Subir; Mahajan, Yashwant Ramachandra

A process for preparing ceramic crucibles having thermal shock resistance and high slag penetration resistance useful for carbon and sulfur analysis of ferrous alloys and steel samples. The crucibles produced by the said process is highly cost effective compared to conventional crucibles for the same application. The raw materials like sillimanite and quartz used for the processing of the crucibles are cheap, readily and abundantly available. The peak temp. being 1300°C. The sintered crucibles when tested against NIST std. steel calibration samples showed excellent carbon and sulfur analysis values which are at par with the imported crucibles. The performance of the crucibles for carbon-sulfur analysis can be attributed to the formation of mullite phase coupled with controlled porosity in the crucibles.

~0 Citings

50. An aqueous gelcasting process for sintered silicon carbide ceramics

By Ganesh, Ibram; Jana, D. C.; Shaik, Shamshad; Thiagarajan, N.
An aq. gelcasting process for the prep. of dense or porous sintered SiC ceramics is presented. A comm. silicon carbide powder coated with phenolic resin was used in this investigation. For the purpose of comparison, a pure SiC powder was also studied. ζ-Potential and viscosity studies revealed that the pure SiC powder requires an electro-steric stabilization, whereas the phenolic resin-coated powder requires an electrostatic stabilization to produce their corresponding aq. slurries with high solids content. Thermogravimetry and DTA techniques have been used to study the decom. behavior of phenolic resin. Aq. slurries contg. 25-50 vol% SiC powder were gelcast and sintered at 2150° for 1 h. The sinterability of gelcast SiC samples was found to be highly influenced by the SiO2 formed on the surface of SiC during aq. processing, as confirmed by FTIR spectroscopy study. The results obtained from various characterization techniques suggest that, to make dense SiC parts with >3.13 g/mL bulk d. (a theor. d. of 97.5%) by an aq. gelcasting process, the starting phenolic resin (~5%)-coated SiC powder should possess a median particle size of <11.0 µm, surface area of > 3.2 m2/g, a compact (green) d. of >1.67 g/mL, and a B content of >0.5%. Further, by using polyethylene granules and org. foaming agents, sintered SiC foam with a porosity of >80%, a compressive strength of >16 MPa and a coeff. of thermal expansion of 4.574 × 10-6/° between 30° and 700° can be prepd. by an aq. gelcasting process, followed by sintering at 2150° for 1 h.

~22 Citings

51. Improved additive composition useful for the preparation of alumina based abrasion resistant material having improved wear properties, and methods for their preparation

By Saha, Bhaskar Prasad; Johnson, Roy; Ganesh, Ibram; Bhattacharjee, Subir; Mahajan, Yashwant Ramchan
From Indian (2006), IN 198068 A1 20060707, Language: English, Database: CAPLUS

A process for the prodn. of alumina based abrasion resistant liner materials, having improved mech. properties. A special inexpensive additive compn. is used to reduce the sintering circle time to minimize the powder consumption. The av. part to be base of the initial principal raw material. Al2O3 is in the range of 4-5 µm. The liner materials' sintering temp. can be reduced to relatively low temp. (1480 to 1500°C). The process involves wet milling of 90-92% by wt. of alpha alumina with an admixt. of sintering agent substantially contg. SiO2, MgO, BaO, CaO, B2O3. The milked powder was subjected to drying followed by pressing the granules in the form of tiles and then substantially liq. phase sintering of the pressed tiles. The sintered tiles showed very good mech. and wear properties.

~0 Citings

52. Improved process for the preparation of magnesium aluminate spinel grains

By Rao, Mantravadi Chan Sekhar; Mahajan, Yashwant Ramchan; Bhattacharjee, Subir; Johnson, Ray; Saha, Bhasker Prasad; Ganesh, Ibram
From Indian (2006), IN 200272 A1 20060707, Language: English, Database: CAPLUS

Improved process for the prepn. of dense magnesium aluminate spinel grains of both low purity (i.e. common spinels) and high purity with a bulk d. of >3.35 g/cc from cheap and readily available Indian raw materials such as alumina sources including α-Al2O3, bauxite, aluminum hydroxide, diaspor, bayerite, and gibbsite, and magnesia sources including MgO, brucite, caustic MgO, and magnesite is disclosed in this process. In this process, calcination temp. has been optimized in such a way that powders obtained from a mixt. of aluminum and magnesium raw materials are highly reactive, porous and friable, which facilitate the ease of grinding operation as well as avoids the powders to be ground into sub-micron size. Calcination as well as sintering temps. used in this process to facilitate spinel phase formation and to obtain desired sintered properties are at least lower by 100 K as compared to existed com. processes.

~0 Citings

53. Vapor-phase hydrogenation of cinnamaldehyde over silica-supported transition metal-based bimetallic catalysts

By Reddy, Benjaram M.; Kumar, Gundapaneni M.; Ganesh, Ibram; Khan, Ataullah

~0 Citings
A series of silica-supported transition metal-based bimetallic catalysts M-M1/SiO2 (M = Co, Ni, and Cu; M1 = Ni, Cu, and Co) were prepd. by the deposition-pptn. method. Nitrate salts of the corresponding transition metals and colloidal silica were used as the precursors. The physicochem. characteristics of the prepd. catalysts were investigated by means of X-ray powder diffraction, thermogravimetry, FT-IR, SEM-energy dispersive X-ray anal., and BET surface area techniques. These catalysts were evaluated for selective hydrogenation of cinnamaldehyde to cinnamyl alc. in the vapor phase at normal atm. pressure. Among the various catalysts investigated, the Cu-Co/SiO2 combination catalyst exhibited very promising results for the selective hydrogenation of cinnamaldehyde to cinnamyl alc., whereas Co-Ni/SiO2 and Ni-Cu/SiO2 bimetallic catalysts provided good yields of hydrocinnamaldehyde.

~9 Citings

54. An improved process for the preparation of substituted benzaldehydes via novel catalyst

By Reddy, Benzaram Mahipal; Ganesh, Ibram; Chowdhury, Biswajit; Reddy, Vangala Ranga
From Indian Pat. Appl. (2005), IN 1999DE00807 A 20051223, Language: English, Database: CAPLUS

An improved process for producing substituted benzaldehydes in greater yields is by vapor phase oxidn. over a novel mixed oxide supported vanadium oxide based catalyst. The gases mixt. consisting of the substituted toluene, air or oxygen and N2 is passed over a novel catalyst at a temp. in the range of 623 K to 723 K and recovering the substituted benzaldehyde by conventional methods. The catalyst used in this process consists of elements of vanadium, molybdenum and oxygen promoted with one of the elements from potassium, calcium, cobalt and antimony on a mixed oxide carrier such as titania-alumina, titania-silica, titania-zirconia and titanium-gallium oxide.

~0 Citings

55. Formation and densification behavior of magnesium aluminate spinel: The influence of CaO and moisture in the precursors

By Ganesh, Ibram; Teja, Kolli Archana; Thiyagarajan, Natarajan; Johnson, Roy; Reddy, Benjaram Mahipal

Different grades of stoichiometric and non-stoichiometric dense magnesium aluminate spinel (MgAl2O4) grains were prepd. by a conventional double-stage firing process using two types of alumina and four types of magnesia raw materials. The MgAl2O4 spinel formation was found to be highly influenced by CaO and moisture present in the precursor oxides as confirmed by TG, DTA, and X-ray diffraction (XRD) techniques. The Fourier transform-IR spectroscopy (FTIR) study of the precursor oxides revealed the presence of moisture. Influence of alumina and magnesia compn. on the densification behavior of MgAl2O4 spinels was assessed by characterizing bulk d. (BD), apparent porosity (AP), water absorption (WA) capacity, and the microstructures of the stoichiometric, the magnesia-rich, and the alumina-rich spinels sintered at 1650°C for 1 h. Sintering studies indicate that to obtain dense stoichiometric spinel grains with >3.35 g/mL BD, <2.0% AP, and <0.5% WA, the spinel powder should possess a median particle size of <2 μm, CaO content of >0.9%, compact (green) d. of >1.95 g/mL, and spinel content of >90%. Among various spinels synthesized, the magnesia-rich spinels exhibited superior properties in terms of high BD, low percentage of AP, and low WA capacity, whereas alumina-rich spinels showed inferior properties. Stoichiometric spinels exhibited an av. grain size of 10 μm whereas alumina-rich spinels with 90% alumina had an av. grain size of 20 μm. The increase in holding time at higher temps. enhanced the sintering properties of the spinels, particularly the magnesia-rich spinels. Further, raw mixts. having >0.9% CaO exhibited better sintered properties as compared with others.

~30 Citings

56. Process for the preparation of a catalyst for oxidation reactions

By Reddy, Benjaram Mahipal; Ganesh, Ibram; Chowdhury, Biswajit; Reddy, Vangala Ranga
From Indian Pat. Appl. (2005), IN 1999DE00809 A 20051104, Language: English, Database: CAPLUS

A process for the prepn. of a new catalyst useful for oxidn. reactions comprises copptn. of a mixed oxide support by a homogeneous pptn. method and impregnating an active oxide on the support material as obtained above, drying the impregnated material at a temp. of 373-393 K, adding promoter oxides to the dried impregnated material, drying again and calcining the material at a temp. in the range of 773 K to 973 K. The catalysts are useful, e.g., for prepn. of 4-methylanisole from 4-methyltoluene.

~0 Citings
57. Microwave-assisted combustion synthesis of nanocrystalline MgAl2O4 spinel powder

By Ganesh, I.; Johnson, R.; Rao, G. V. N.; Mahajan, Y. R.; Madhavendra, S. S.; Reddy, B. M.

A stoichiometric MgAl2O4 spinel powder was prepd. by a microwave-assisted combustion synthesis (MWCS) route. For the purpose of comparison, another stoichiometric MgAl2O4 spinel powder was also prepd. following the conventional combustion synthesis (CCS) method. The batch size had a strong influence on the sp. surface area of the material, which in turn is highly dependent on the prep. method adopted. The surface areas of these prep. powders were found to decrease from 36.78 to 0.1 m²/g for MWCS and 126 to 8.06 m²/g for CCS samples, resp., when the batch size was increased from 2 to 100 g. This could be attributed to sintering of the samples due to high adiabatic temp. generated as a result of increased heat accumulation with bigger batch quantities. Between the 2 powders prepd. by the 2 different routes, the powders obtained by MWCS and CCS routes were found to contain grains/crystals in range of 20-50 and 100-250 nm size, resp. The TG-DTA and x-ray diffraction studies reveal that microwave-assisted combustion synthesis route yields materials with higher degree of compositional stability and phase purity as compared to the conventional combustion synthesis method.

~50 Citings

58. Microwave-induced combustion synthesis of nanocrystalline TiO2-SiO2 binary oxide material

By Ganesh, I.; Johnson, R.; Mahajan, Y. R.; Khan, A.; Madhavendra, S. S.; Reddy, B. M.

A nanocryst. titania-silica (1:1 molar ratio) binary oxide material was synthesized by microwave-induced combustion process in a modified domestic microwave oven (operated at 2.45 GHz frequency and 700 W power) in approx. 60 min from in situ synthesized titanyl nitrate and siliconyl nitrate using urea as fuel. For the sake of comparison, two different types of TiO2-SiO2 powders were also synthesized by the sol-gel and the co-pptn. methods. All the synthesized powders were characterized with the help of TG/DTA, x-ray diffraction, TEM, and BET surface area measurements and the results compared. The as-synthesized TiO2-SiO2 powder obtained by the combustion process showed an av. crystalite size of 10 nm and the sp. surface area of 115 m².g⁻¹. Among the 3 differently synthesized TiO2-SiO2 powders, only the microwave-induced combustion synthesis process yielded cryst. material. TEM in particular confirmed the presence of nano-sized particles in the microwave-induced combustion-synthesized powder. Among the 3 analogies, microwave synthesis was found to be superior in terms of ease of processing leading to time and power savings.

~8 Citings

59. process for the preparation of quinolines from aromatic amines and di/trihydric alcohols in the presence of supported mixed metal oxide catalysts.

By Reddy, Benjaram Mahipal; Ganesh, Ibram; Chowdhury, Biswajit; Reddy, Vangalaranga
From Indian (2004), IN 193539 A1 20040724, Language: English, Database: CAPLUS

An improved process for the prepn. of quinolines (I; R = H, Me, Cl; and R1 = H, Me Cl, OH, OMe, NO2) comprises reaction of arom. amines with di/trihydric alcs. in a molar ratio of 0.5-1.5/1.5-3.0 in the vapor phase over a novel mixed metal oxide catalyst wherein metal is selected from Cu, Zn, or Cr supported on alumina, titania, silica, alumina-silica, alumina-titania, or titania-silica at 623-724 K. Thus, aniline and glycerol were fed to a reactor packed with Cu-Zn-Al oxide particles mixed with quartz beads at 723 K to give 62% quinoline.

~0 Citings
60. Rheometric studies on cordierite-mullite precursor mix for extrusion of honeycomb structures
By Chacko, Seetu; Johnson, Roy; Saha, B. P.; Ganesh, I.; Vijayakumar, M.; Mahajan, Y. R.
From Transactions of the Indian Ceramic Society (2004), 63(2), 119-123. Language: English, Database: CAPLUS
An attempt has been made to evaluate the rheol. characteristics of a cordierite-mullite precursor oxides based dough with appropriate proportions of additives using an indigenously designed and fabricated capillary extrusion die coupled with a universal testing machine. Further, the pressure profile of the extrusion process was analyzed using Benbow's paste flow model, which showed a clear dependence of die land region and negligible effect of die entry on extrusion velocity with respect to L/d ratios. The flow characteristics were also analyzed using power law model after incorporating Bagley's entry correction. Viscosity-shear rate data show that the variation is towards Newtonian behavior with a power law exponent of 0.63 for shear rates <50 s⁻¹, while at higher shear rates, it is distinctly non-Newtonian with a power law exponent of typically 0.31.
~0 Citings

61. Stabilization of nanosized titania-anatase for high temperature catalytic applications
By Reddy, Benjaram M.; Ganesh, Ibram; Khan, Ataullah
M2O3-TiO2 (M = Ga, In and La) composite oxides were prep'd. by a co-pptn. method with in situ generated ammonium hydroxide and were impregnated with 12 wt.% V2O5. The M2O3-TiO2 and V2O5/M2O3-TiO2 (M = Ga, In and La) samples were subjected to thermal treatments from 773 to 1073 K and were investigated by X-ray diffraction, FT-IR, and BET surface area methods to establish the effects of vanadia loading and thermal treatments on the surface structure of the dispersed vanadium oxide species and temp. stability of these catalysts. Characterization results suggest that the co-pptd. M2O3-TiO2 composite oxides are in X-ray amorphous state and exhibit reasonably high sp. surface area at 773 K calcination. The M2O3-TiO2 mixed oxide supports also accommodate a monolayer equiv. of V2O5 (12 wt.%) in a highly dispersed state. The V2O5/M2O3-TiO2 catalysts are thermally stable up to 873-973 K calcination temp. When subjected to thermal treatments beyond 873-973 K, the dispersed vanadium oxide selectively interacts with In2O3 or La2O3 portions of the resp. mixed oxides and forms InVO4 or LaVO4 compds. The remaining TiO2 appears in the form of anatase or rutile phase. In the case of V2O5/Ga2O3-TiO2 sample, no such surface vanadate compd. formation was obsd. All samples were evaluated for one step synthesis of 2,6-dimethylphenol from cyclohexanone and methanol mixts. in the vapor phase at normal atm. pressure. The 12% V2O5/La2O3-TiO2 catalyst exhibited good conversion and product selectivity among various samples investigated.
~20 Citings

62. Effect of preparation method on sinterability and properties of nanocrystalline MgAl2O4 and ZrO2-MgAl2O4 materials
By Ganesh, I.; Srinivas, B.; Johnson, R.; Rao, G. V. N.; Mahajan, Y. R.
Nanocryst. MgAl2O4 and ZrO2-MgAl2O4 powders were synthesized by combustion and conventional solid state reaction routes. The synthesized powders were processed, dry pressed, and sintered for 3 h at 1550-1625°C. The sintered pellets were then characterized in terms of phase (XRD), microstructure (SEM), relative d., apparent porosity, water absorption, hardness, three point bend strength, and fracture toughness. The XRD studies revealed that ZrO2 was present in tetragonal form in the case of combustion synthesized powders (CSP), whereas in powders obtained by solid state reaction (SSP) it was present in the monoclinic form. This study also revealed that the addn. of ZrO2 improved the mech. properties of sintered MgAl2O4 samples: 20 wt-%ZrO2-MgAl2O4 composites prep'd. from CSPs and conventional SSPs and sintered to 1625°C for 3 h had fracture toughness of 5.96 and 4.33 MPa.m¹/² and 3-point bend strength of 269 and 98 MPa, resp. Higher sintered d., the presence of tetragonal zirconia as a major phase, and the finer microstructure are probably responsible for the superior mech. properties exhibited by sintered CSP materials as compared with the sintered SSPs.
~16 Citings
63. Effect of rubber encapsulation on the comparative mechanical behaviour of ceramic honeycomb and foam

By Jain, Vipin; Johnson, Roy; Ganesh, I.; Saha, B. P.; Mahajan, Y. R.

Cordierite-mullite honeycombs with square cells were prepared by an extrusion technique. Mech. behavior of the honeycomb was compared with that of commercial ceramic foam with and without rubber encapsulation. While impact testing, honeycombs as well as foam had shown low energy absorption, which was increased substantially upon rubber encapsulation in both cases. It has been found that the honeycomb absorbs significant amounts of energy under compression when loaded in the direction parallel to channel walls in comparison with when it is loaded in the perpendicular direction. Upon rubber encapsulation, honeycomb had shown substantial decrease in the absorbed energy parallel to channels, whereas, there was modest increase in the perpendicular direction. However, in both the orientations the stress was decreased upon rubber encapsulation. The foam on other hand absorbed significantly lower energy under compression in comparison with that of the bare honeycombs. Interestingly, upon rubber encapsulation, the foam had shown increased amounts of energy absorption as well as enhancement in the critical stress, contrary to the behavior observed in the case of honeycombs. Failure mechanisms for the different types of configurations with and without rubber encapsulation are proposed in this paper.

~2 Citings

64. Microwave assisted solid state reaction synthesis of MgAl2O4 spinel powders

By Ganesh, Ibram; Srinivas, Bakki; Johnson, Roy; Saha, Bhaskar P.; Mahajan, Yashwant R.

Stoichiometric MgAl2O4 spinel powders were prepared by microwave-assisted solid-state reaction (MWSSR powders) in a domestic microwave (MW) oven (2.45 GHz frequency, 700 W power) from aluminum hydroxide and caustic MgO in the presence of carbon black (10-50 wt.% with respect to total raw mix). 20% C was found to be sufficient to produce spinel powder with 82% spinel content within 100 min while 50% C was able to produce 93% spinel containing powder within the same time. In conventional solid-state reaction (CSSR), to obtain the powder with the same amount of spinel phase (i.e., =93%), the above raw mix was calcined at 1350° for 1 h and the total heating and cooling cycle time was more than 24 h. For the purpose of better comparison, three other stoichiometric MgAl2O4 powders were also prepared following conventional combustion synthesis using urea (CUCS powder) or sucrose (CSCS powder) as a fuel, and microwave assisted combustion synthesis using urea as a fuel (MWUCS powder), respectively. Effects of synthesis route on the powder properties were assessed by XRD, SEM, BET surface area, and particle size analysis. Among the various powders studied, the MWSSR powder was found to be superior as far as saving in processing time and power is concerned in addition to good sintering characteristics in terms of bulk density (B.D), apparent porosity, and water absorption.

~42 Citings

65. Preparation and characterization of In2O3-TiO2 and V2O5/In2O3-TiO2 composite oxides for catalytic applications

By Reddy, Benjaram M.; Ganesh, Ibram; Khan, Ataullah

In2O3-TiO2 (1:13 mol ratio) mixed oxide was prepared by a co-pptn. method with in situ generated ammonium hydroxide and was impregnated with various amounts of V2O5 (4-12 wt.%). The In2O3-TiO2 and V2O5/In2O3-TiO2 samples were subjected to thermal treatments from 773 to 1073 K and were studied by X-ray diffraction, FT-IR, and BET surface area methods to establish the effects of vanadia loading and thermal treatments on the surface structure of the dispersed vanadium oxide species and temp. stability of these catalysts. Characterization results suggest that the co-pptd. In2O3-TiO2 is in X-ray amorphous state and exhibits reasonably high sp. surface area. The In2O3-TiO2 also accommodates a monolayer equiv. of V2O5 (12 wt.%) in a highly dispersed state. The V2O5/In2O3-TiO2 catalyst is thermally stable up to 873 K calcination temp. When subjected to thermal treatments beyond 873 K, the dispersed vanadium oxide selectively interacts with In2O3 portion of the mixed oxide and forms InVO4 compd. The remaining TiO2 appears in the form of anatase or rutile phase. These samples were evaluated for one-step synthesis of 2,6-dimethylphenol from cyclohexanone and methanol mixts. in the vapor phase at normal atm. pressure. The 12% V2O5/In2O3-TiO2 catalyst exhibits good conversion and product selectivity among various samples studied.

~10 Citings
66. Solid state reactions of cordierite precursor oxides and effect of CaO doping on the thermal expansion behaviour of cordierite honeycomb structures

By Johnson, R.; Ganesh, I.; Saha, B. P.; Rao, G. V. Narasimha; Mahajan, Y. R.

The extruded cordierite honeycomb structure from a stoichiometric formulation of talc, kaolinite, and alumina was subjected to TGA-DSC, dilatometric and XRD investigations. The exptl. observations were made to identify the phase transformation sequence to understand the solid state reactions involved in the cordierite formation. A max. cordierite content of 90% was achieved for the samples sintered at 1693 K with a soaking time of 4 h, corresponding to a lowest coeff. of thermal expansion (CTE) of 0.74 × 10^{-6}/K (along the direction of extrusion) was obsd. Attempts were made to establish correlations with cordierite content, processing temp. and CTE of the samples. A few mechanisms are proposed to explain our observations. Attempts are also made to rationalize the low CTE obsd. along the direction of extrusion on the basis of orientation of anisotropic cordierite crystals as revealed by the transverse I-ratio calcd. from the XRD patterns. Effect of CaO doping on CTE of cordierite has been studied in the present work. It was obsd. that though there is an increase in bulk thermal expansion of cordierite honeycombs on CaO doping due to the absence of micro-cracks as revealed by thermal cycling hysteresis, axial anisotropy was found to be reduced significantly.

~4 Citings

67. Studies on energy absorption characteristics of cordierite-mullite honeycombs

By Johnson, Roy; Jain, Vipin; Ganesh, I.; Saha, B. P.; Mahajan, Y. R.; Kamat, S. V.

Ceramic honeycombs have found diversified applications for thermo-structural implementations mainly due to their unique configuration and outstanding combination of mech. & thermal properties. However, their potential for energy absorption based applications has not been fully explored in view of their inherent brittleness. The present study involves prepn. of cordierite-mullite ceramic honeycombs of a selected compn. followed by their characterization for evaluation of physico-chem. and mech. properties. It has been found that honeycomb structures absorb significant amt. of energy under compression when loaded in the direction parallel to channel walls in comparison of solid ceramics, which fail catastrophically. When encapsulated with rubber, the honeycombs have shown significant increase in specific impact energy, which confirms that these materials can be explored for energy absorption applications.

~3 Citings

68. An efficient MgAl2O4 spinel additive for improved slag erosion and penetration resistance of high-Al2O3 and MgO-C refractories

By Ganesh, I.; Bhattacharjee, S.; Saha, B. P.; Johnson, R.; Rajeshwari, K.; Sengupta, R.; Ramana Rao, M. V.; Mahajan, Y. R.

A stoichiometric dense MgAl2O4 spinel has been prepd. according to a conventional double stage firing process using AlCl3 as a sintering aid. A stoichiometric mixt. of aluminum trihydroxide and caustic MgO was calcined at 1300°C for 1 h to achieve a desired degree of spinelization. AlCl3 in different amts., i.e. 0.911, 1.822 and 2.733 wt.%, was coated on spinelized powder using wet-impregnation technique and sintered at 1500-1600°C for 1 h. Among the spinels sintered at 1550°C for 1 h, spinel incorporated with 2.733 wt% AlCl3 exhibited superior properties in terms of bulk d., apparent porosity and water absorption. This sintered stoichiometric spinel was further characterized by means SEM, energy dispersive anal. with X-rays (EDAX) and electron probe microanal. (EPMA). EDAX anal. revealed that AlCl3 as a sintering aid helps in reducing the Na2O present in the raw materials compn. after sintering. EPMA studies revealed that spinel prepd. in this study is well comparable with the com. spinel (Alcoa, AR-78, USA). Finally, 20 wt.% of the stoichiometric spinel incorporated with 2.733 wt.% AlCl3 prior to sintering was added to high-Al2O3 and MgO-C refractories to evaluate its effect on slag erosion and penetration resistance as well as on repeated permanent linear change (PLC) of these bricks. By the addn. of stoichiometric MgAl2O4 spinel, the slag erosion and penetration resistance of high Al2O3 and MgO-C refractories was improved remarkably, and their PLCs exhibited more steady and stable pos. values after spinel addn.

~44 Citings

69. Effect of fuel type on morphology and reactivity of combustion synthesized MgAl2O4 powders

By SciFinder®

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Two types of stoichiometric MgAl2O4 spinel powders were prepd. by combustion synthesis routes, using sucrose (SCS) or urea (UCS) as fuel. For comparative purposes a stoichiometric MgAl2O4 powder was also prepd. by solid state reaction synthesis (SS powder). Pressed compacts of the 3 powder types were sintered at 1575-1625°C for 2 h. After grinding, SCS and SS powders had very narrow particle size distributions, with av. particle sizes of 3.17 and 4.13 µm, resp., whereas UCS powder showed a wide particle size distribution with an av. particle size of 37.76 µm. Their corresponding surface areas were 65.8, 8.67, and 8.06 m².g⁻¹. The SCS MgAl2O4 powder sintered at 1625°C for 2 h had a bulk d. of 3.44 g.cm⁻³ (96%), an apparent porosity of 1.76%, and water absorption of 0.519%. The superior properties of SCS powders compared with other spinel powders are attributed to the higher surface area induced by the larger size of the sucrose mol. and the greater amt. of gas evolved during sucrose combustion.

~29 Citings

70. A new sintering aid for magnesium aluminate spinel

By Ganesh, I.; Bhattacharjee, S.; Saha, B. P.; Johnson, R.; Mahajan, Y. R.

A dense MgAl2O4 sintered spinel has been prepd. following a conventional double stage firing process. A new type of sintering aid, AlCl3, can improve the bulk d., apparent porosity, and water absorption of MgAl2O4 spinel sintered at 1550° devoid of any contamination. To see the effect of AlCl3 on densification and formation of a MgAl2O4 spinel, 0.01-0.03 mol% AlCl3 was added sep. prior to calcination, subsequent to calcination as well as simultaneously at both stages. AlCl3 is found to be equally effective in enhancing spinel formation during calcination as well as in increasing sintered d. The efficacy of AlCl3 as a "spinelizer" or as a sintering aid is also compared with the conventional mineralizer, AlF3, which is generally added only prior to calcination to enhance the spinel formation. AlCl3 is found to be active as a sintering aid provided the powder contains some free Al2O3 and MgO and probably the hygroscopic nature of AlCl3 is responsible for its effectiveness as a sintering aid.

~33 Citings

71. Characterization of La2O3-TiO2 and V2O5/La2O3-TiO2 catalysts and their activity for synthesis of 2,6-dimethylphenol

By Reddy, B. M.; Ganesh, I.

The La2O3-TiO2 (1:5 molar ratio) mixed oxide was prepd. by a co-pptn. method with in situ generated ammonia and was impregnated with various amts. of vanadia (4-12 wt. %). The La2O3-TiO2 and the V2O5/La2O3-TiO2 catalysts were subjected to thermal treatments from 773 to 1073 K and were investigated by X-ray diffraction, FT-IR, BET surface area, and O2 chemisorption methods to establish the effects of vanadia loading and thermal treatments on the surface structure of the dispersed vanadium oxide species and the temp. stability of these catalysts. Conversion of cyclohexanol to cyclohexanone/cyclohexene was investigated as a model reaction to assess the acid-base properties of these materials. The catalytic property was evaluated for a single step synthesis of 2,6-dimethylphenol from cyclohexanol and methanol in the vapor phase at normal atm. pressure. Characterization results suggest that the co-pptd. La2O3-TiO2, when calcined at 773 K, is in X-ray amorphous state and exhibits reasonably high sp. surface area. The amorphous La2O3-TiO2 is converted to cryst. compds. La2Ti2O7 and La4Ti9O24 at 873 and 1073 K, resp. The La2O3-TiO2 also accommodates a monolayer equiv of V2O5 (12 wt. %) in a highly dispersed state on its surface. The V2O5/La2O3-TiO2 catalyst is thermally quite stable up to 873 K calcination temp. When subjected to thermal treatments beyond 873 K, the dispersed vanadium oxide selectively interacts with the La2O3 portion of the mixed oxide and forms a LaVO4 compd. The remaining TiO2 appears in the form of anatase phase. La2O3-TiO2 and the V2O5/La2O3-TiO2 differ in terms of acid-base properties, and the 12% V2O5/La2O3-TiO2 catalyst provided a max. yield of 2,6-dimethylphenol among various catalysts investigated.

~31 Citings

72. Surface characterization of Ga2O3-TiO2 and V2O5/Ga2O3-TiO2 catalysts
The techniques of XPS, x-ray diffraction, FT-IR, and O2 chemisorption were employed to characterize a specially obtained Ga2O3-TiO2 mixed oxide and V2O5/Ga2O3-TiO2 catalyst calcined at different temps. from 773-1073 K. The Ga2O3-TiO2 (1:5 mol ratio based on the oxides) mixed oxide was synthesized by a homogeneous copptn. method with in situ generated NH4OH, and a nominal 4 wt % V2O5 was impregnated over the calcined support (773 K) by adopting a wet impregnation technique. A com. TiO2 (anatase) sample was also used in this study for comparison purposes. The Ga2O3-TiO2 mixed oxide, calcined at 773 K, primarily consists of a mixt. of TiO2 anatase and α-Ga2O3. In the case of the V2O5/Ga2O3-TiO2 catalyst, the impregnated V2O5 is in a highly dispersed state on the surface of the mixed oxide. Under the influence of thermal treatments from 773-1073 K, the dispersed V oxide promotes the transformation of anatase to rutile and α-Ga2O3 to β-Ga2O3 and is accompanied by a loss in the sp. surface area of the samples. In particular, the gallia in the V2O5/Ga2O3-TiO2 catalyst retards the transformation of anatase into rutile. The Ti 2p, Ga 3d, and V 2p photoelectron peaks of the V2O5/Ga2O3-TiO2 sample are highly sensitive to the calcination temp. The XPS line shapes and the corresponding binding energies indicate that the dispersed vanadium oxide in the V2O5/Ga2O3-TiO2 catalyst interacts preferably with the Ga oxide. The V/Ti and V/Ga at. ratios as detd. by XPS measurements reveal that more V is confined to Ti than Ga at 773 and 873 K and almost equally at 973 and 1073 K calcination temps., resp.

~30 Citings

73. Thermal anisotropy in sintered cordierite monoliths

By Saha, B. P.; Johnson, R.; Ganesh, I.; Rao, G. V. N.; Bhattacharjee, S.; Mahajan, Y. R.
From Materials Chemistry and Physics (2001), 67(1-3), 140-145. Language: English, Database: CAPLUS, DOI:10.1016/S0254-0584(00)00431-4

Cordierite honeycombs with oxide compns. of 49.5-51 wt.% SiO2, 35.5-36 wt.% Al2O3 and 14-14.5 wt.% MgO were prepd. from clay, talc, and alumina using conventional extrusion process. The effects of sintering parameters such as heating rate, soaking time, cooling rate as well as amt. of calcined clay in the raw material compns. on the overall coeff. of thermal expansion (CTE) as well as thermal anisotropy in terms of CTE difference between the extrusion direction and across the extrusion direction of the cordierite honeycombs were studied. For this purpose, extruded honeycombs were sintered with various heating and cooling rates of 80-180°C.h-1 up to a peak temp. of 1420°C for soaking times 4-8 h. All the sintered cordierite honeycombs were characterized with respect to phase compn. (XRD), morphol. (SEM), bulk d., water absorption, apparent porosity, and CTE (dilatometric studies). XRD studies reveal that all the investigated sintered honeycombs contain >90% cordierite phase with smaller quantities of mullite, spinel and α-Al2O3. Raw materials compns. contg. 60% calcined clay of total clay yielded crack free honeycombs with lower thermal anisotropy. Among the various parameters studied, honeycombs sintered with heating rate of 80°C h-1, soaking time of 8 h and cooling rate of 180°C h-1 showed min. thermal anisotropy.

~19 Citings

74. Ceramic based catalytic convertors for diesel vehicles

By Johnson, Roy; Saha, B. P.; Ganesh, I.; Mahender, V.; Bhattacharjee, S.; Mahajan, Y. R.; Khaja, M. M. K.

Recently implemented Euro norms for pollutants from diesel-fueled vehicles necessitates stringent control of CO, unburned hydrocarbons (HC), NOx, and particulates. Of various technol. options available to control these pollutants, a catalytic converter in combination with catalyzed diesel particulate filter was identified as an available practical systems to achieve desired emission limits; however, successful operation of this system, based on catalyst technol., requires the use of low S diesel fuel. In India, this technol. becomes complicated due to high S content (0.25-0.3 wt. percent) in diesel fuel. This is because reducing one pollutant can result in increasing another, esp. particulates. To provide a practical soln. via catalytic control for a high S diesel exhaust, a converter system consisting of reticulated foam coated with a combustion catalyst in combination with indigenously developed honeycombs with a selective 3-way catalyst was developed. The converter was evaluated for its performance using a high speed, medium duty diesel engine at Automotive Research Assocn., Pune, India. The converter indicated a simultaneous decrease in CO, HC, NOx, and particulates as discussed.

~2 Citings
75. Vapor phase synthesis of quinoline from aniline and glycerol over mixed oxide catalysts

By Reddy, B. M.; Ganesh, I.

The vapor phase synthesis of quinoline from aniline and glycerol (1:2 mol ratio) in a single step was investigated over ZnO-Cr2O3, CuO-ZnO/Al2O3, MoO3-V2O5/Al2O3 and NiO-MoO3/Al2O3 catalysts in the presence of air at 623-723 K under normal atm. pressure. Among these catalysts investigated, the CuO-ZnO/Al2O3 combination effectively performed this reaction with high activity and selectivity.

~9 Citings

76. Design of stable and reactive vanadium oxide catalysts supported on binary oxides

By Reddy, Benjaram M.; Ganesh, Ibram; Chowdhury, Biswajit

A series of titania based mixed oxides viz., TiO2-SiO2, TiO2-Al2O3, TiO2-ZrO2, and TiO2-Ga2O3, were prepd. by a co-pptn. method. These mixed oxides were impregnated with V2O5 ranging from 2 to 30 wt.% by using ammonium metavanadate as source of vanadium oxide. The mixed oxide supports and the vanadia impregnated catalysts were then subjected to thermal treatments from 773 to 1073 K and were investigated by XRD, FTIR, O2 uptake and BET surface area methods to establish the effects of vanadia loading and thermal treatments on the surface structure of dispersed vanadia species and thermal stability of the catalysts. Calcination of copptd. support hydroxides at 773 K resulted in the formation of an amorphous phase, and further heating to 1073 K resulted in the formation of titania anatase phase, except with TiO2-ZrO2 support where a ZrTiO4 compd. was obsd. All these mixed oxides exhibited a high thermal stability. Oxygen uptake results suggested a high dispersion of vanadia on these mixed oxide supports when calcined at 773 K. The mixed oxide based V2O5 catalysts studied are found to be very active and selective for the synthesis of isobutyraldehyde from methanol and ethanol, and for the selective oxidn. of 4-methylanisole to anisaldehyde.

~49 Citings

77. Development of indigenous thin walled honeycomb substrates for catalytic converters

By Johnson, Roy; Saha, B. P.; Ganesh, I.; Mahender, V.; Reddy, D. S.; Bhattacharjee, S.; Mahajan, Y. R.; Khaja, M. M. K.

Auto-emission control using ceramic honeycomb based catalytic converters are certified as one of the best practicable technologies currently available. A low thermal expansion cordierite 2:2:5 magnesia:alumina:silica stoichiometry has been optimized with Indian raw materials suitable for Indian road conditions. This formation with proper binder was extruded into thin walled (0.2-0.22 mm) honeycomb structures using indigenously fabricated dies. These honeycombs are dried at controlled conditions and fired to achieve the cordierite phase. These honeycombs are characterized for their crit. properties such as crushing strength and coeff. of thermal expansion in different geometrical axes, porosity, pore size distribution and thermal shock resistance. The honeycombs are further wash coated, catalyst coated and specially canned to form the complete catalytic converter assembly.

~0 Citings

78. Aniline synthesis from cyclohexanol and ammonia over mixed oxide catalysts

By Manohar, Basude; Ganesh, Ibram; Reddy, Benjaram M.

Aniline is obtained by amination of cyclohexanol followed by oxidative dehydrogenation over MoO3/Al2O3, V2O5-MoO3/Al2O3 and NiO-MoO3/Al2O3 catalysts in the presence of NH3/air at 623-723 K.

~4 Citings
79. Characterization of V2O5/TiO2-ZrO2 Catalysts by XPS and Other Techniques

By Reddy, Benjaram M.; Chowdhury, Biswajit; Ganesh, Ibram; Reddy, E. P.; Rojas, T. C.; Fernandez, A.

A high surface area titania-zirconia mixed oxide support was prepd. by the technique of pptn. from homogeneous solns. Vanadia (12 wt %) was impregnated on TiO2-ZrO2 support by using an oxalic acid soln. of NH4VO3. The TiO2-ZrO2 binary oxide support and the V2O5/TiO2-ZrO2 catalyst were then subjected to thermal treatments from 500 to 800 °C. The influence of thermal treatments on the dispersion and stability of the catalyst was investigated by X-ray diffraction (XRD), FT IR (FTIR), UV-vis absorption, and XPS (XPS) techniques. The characterization results suggest that the TiO2-ZrO2 binary oxide support is thermally quite stable up to 800 °C. Calcination of the coppd. titanium-zirconium hydroxides at 500 °C result in the formation of an amorphous phase, and further heating at 600 °C converts this amorphous phase into a cryst. ZrTiO4 compd. Impregnation of V2O5 and heating of the V2O5/TiO2-ZrO2 catalyst beyond 600 °C results in the formation of ZrV2O7, with the simultaneous presence of the TiO2 rutile phase. However, the vanadia is in a highly dispersed state on the TiO2-ZrO2 mixed oxide support when calcined at less than 600 °C.

~45 Citings

80. Influence of V2O5 and Nb2O5 on thermal stability of TiO2-anatase

By Reddy, B. M.; Ganesh, I.; Reddy, V. R.

Influence of V2O5 and Nb2O5 on the thermal stability of TiO2 anatase was detd. with samples of identical compn. and on the same support material. Vanadia and niobia behave differently when deposited on the surface of TiO2; vanadia is more reactive than niobia transforming anatase into rutile; cryst. vanadium oxide on TiO2 does not exist when this catalyst is calcined at and above 1073 K; on the contrary, the cryst. Nb2O5 is seen when Nb2O5 catalyst is calcined at and above 1173 K and the TiO2 anatase is quite thermally stable up to 1073 K in the presence of Nb2O5.

~6 Citings

81. Selective oxidation of p-methoxytoluene to p-methoxybenzaldehyde over supported vanadium oxide catalysts

By Reddy, Benjamin M.; Reddy, E. P.; Ganesh, I.; Kumar, M. Vijaya

Partial oxidn. of p-methoxytoluene to p-methoxybenzaldehyde was studied in vapor phase at normal atm. pressure over titania, alumina, titania-alumina, titania-silica, titania-zirconia, titania-silica-zirconia, silica-zirconia, magnesia, calcia-magnesia supported vanadia catalysts. Vanadium oxide on basic supports, MgO and CaO-MgO, shows better selectivity towards p-methoxybenzaldehyde with considerable conversion of p-methoxytoluene at 673 K. However, other acidic single and mixed oxide supported vanadium oxide catalysts exhibit poor selectivity at high conversion.

~6 Citings

82. Study of Dispersion and Thermal Stability of V2O5/TiO2-SiO2 Catalysts by XPS and Other Techniques

By Reddy, Benjaram M.; Ganesh, I.; Reddy, E. Padmanabha

A high surface area titania-silica binary oxide support was prepd. according to the homogeneous pptn. method and was coated with a monolayer of vanadium oxide. The TiO2-SiO2 support and the V2O5/TiO2-SiO2 catalyst were then subjected to thermal treatments from 773 to 1073 K. The influence of heat treatments on the dispersion and thermal stability was investigated by X-ray diffraction, FTIR, XPS, oxygen uptake, and BET surface area methods. The results suggest that TiO2-SiO2 is quite thermally stable even up to 1073 K calcination temp. However, the V2O5/TiO2-SiO2 catalyst is stable, in terms of dispersion and surface area, only up to a calcination temp. of 873 K. Thermal treatments beyond this temp. transformed vanadia and titania into cryst. phases and then titania anatase into rutile phase.

~63 Citings
83. Vapor phase synthesis of isobutyraldehyde from methanol and ethanol over mixed oxide supported vanadium oxide catalysts

By Reddy, B. M.; Reddy, E. P.; Ganesh, I.
From Research on Chemical Intermediates (1997), 23(8), 703-713. Language: English, Database: CAPLUS, DOI:10.1163/156856797X00493

The vapor phase synthesis of isobutyraldehyde from methanol and ethanol in one step was investigated over titania-silica, titania-alumina, titania-zirconia, titania-silica-zirconia, and magnesia supported vanadium oxide catalysts at 623 K and under normal atm. pressure. Among various catalysts the titania-silica binary oxide supported vanadia provided higher yields than the other single or mixed oxide supported catalysts. The high conversion and product selectivity of V2O5/TiO2-SiO2 catalyst (20 wt% V2O5) was related to the better dispersion of vanadium oxide over titania-silica mixed oxide support in addn. to other acid-base and redox characteristics. A reaction path for the formation of isobutyraldehyde from methanol and ethanol mixts. over these catalysts was described.

~8 Citings

84. Vapor-phase selective oxidation of 4-methylanisole to anisaldehyde over V2O5/Ga2O3-TiO2 catalyst

By Reddy, Benjaram M.; Ganesh, Ibram; Chowdhury, Biswajit

The vapor phase partial oxidn. of 4-methylanisole to p-anisaldehyde was investigated over binary oxide supported vanadium oxide catalysts at 623-748 K under normal atm. pressure. Among various catalysts the V2O5/Ga2O3-TiO2 effectively performed this reaction with high activity and selectivity.

~20 Citings

85. Influence of Li-doping on structural characteristics and photocatalytic activity of ZnO nano-powder formed in a novel solution pyro-hydrolysis route

By Ganesh, Ibram; Sekhar, P. S. Chandra; Padmanabham, G.; Sundararajan, G.

Different types of Li-doped ZnO (LDZ) (Li = 0-10 wt.%) powders were prepd. by following a novel pyro-hydrolysis route at 450 °C, and were thoroughly characterized by means of thermo-gravimetry (TG), differential scanning calorimetry (DSC), X-ray diffraction (XRD), SEM (SEM), transmission electron microscopy (TEM), Fourier-transform IR (FT-IR), Fourier-transform Raman (FT-Raman) spectroscopy, diffuse reflectance spectroscopy (DRS), ultra-violet visible (UV-Vis) spectroscopy, Brunauer-Emmett-Teller (BET) surface area (SA), and zeta potential (ζ) measurements. Photocatalytic activity of these powders was evaluated by means of methylene blue (MB) degrdn. expts. conducted under the irradn. of simulated and natural solar light. Characterization results suggest that both pure ZnO and LDZ powders are quite thermally stable up to a temp. of 700 °C and possess band gap (BG) energies in the range of 3.16-3.2 eV with a direct band to band transition and ζ values of -31.6 mV to -56.4 mV. The properties exhibited by LDZ powders were found to be quite comparable to those exhibited by p-type semi-conducting LDZ powders. In order to study the kinetics of MB degrdn. reaction under the irradn. of simulated solar light, the Li (0.2-10 wt.%) and Al (0.5 wt.%) co-doped ZnO (0.2LADZ to 10LADZ) powders were also synthesized and employed for this purpose. The photocatalytic degrdn. of MB over LADZ catalysts followed the Langmuir-Hinshelwood (L-H) first order reaction rate relationship. The 10LADZ catalyst exhibited highest photocatalytic activity among various powders investigated in this study.

~0 Citings