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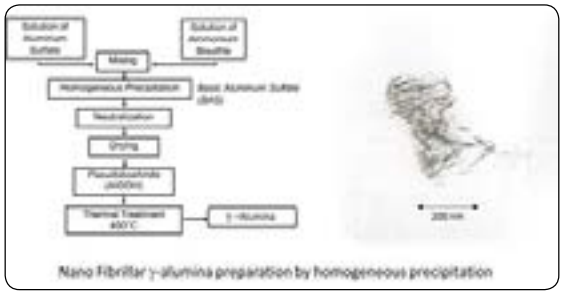
Homogeneous precipitation of ceramic powders preparation from sulfate-sulfite-ammonia system

Satoshi Sugita
University of Guanajuato, Mexico

High quality ceramic powders can be produced by homogeneous precipitation. This method permits to control purity, particle size, shape, distribution and homogeneity, as known these factors play a very important role in the properties of finished ceramic materials. Alumina nano-sized particles could be obtained starting from the admixture of solutions of aluminum sulfate and ammonium bisulfite. The homogeneous precipitation carried out at pH 4.2, when the mixture of solutions was heated to the decomposition and boiling temperature. Nano-, spherical with narrow size distribution, and soft agglomerated, the basic aluminum sulfate (BAS) was easily produced. The powder was heated at 950 °C to decompose sulfate and then was calcined a 1250°C to transform to α-alumina. Otherwise, treating BAS with aqueous ammonium solution, the precipitate could be transformed to nano-sized fibrillar pseudoboehmite, which could be transformed to α-alumina by calcining. On the other hand, to prepare mullite precursor, initially the silica nano powder (Aerosil 200, Degussa) was dispersed in water and mixed with the solutions of aluminum sulfate and ammonium bisulfite. The admixture was heated to the decomposition and boiling temperature, in which a precipitate of silica covered with BAS was produced. This precursor was transformed to mullite heating at 1250°C. The other application example of this homogeneous precipitation is used to prepare in the fabrication of basic chromium sulfate. Starting from the admixture of solutions of chromium sulfate and ammonium bisulfite, the basic chromium sulfate can be precipitated. But in the last case it is not easy for all chromium precipitate since chromium forms a water soluble complex with ammonia. Even though, almost every chromium can be precipitated. In this presentation, a simple useful technique of homogeneous precipitation for preparing the basic sulfate salts of metals starting from the admixture of metal ion-sulfate-sulfite-ammonia aqueous system is discussed.



Nano Fibrillar γ-alumina preparation by homogeneous precipitation

Recent Publications:

1. Rocha J, Guo Y, Martinez JM, Sugita S, Redington W, Pomeroy M, Hampshire M (2016) Liquid/glass Immiscibility in yttria doped mullite ceramics. J. Eur. Ceram. Soc. 36:3523-3530
2. López FJ, Sugita S, Kobayashi T (2014) Cesium-adsorbent geopolymer foams based on silica from rice husk and metakaolin. Chem. Lett. 43:128–30.
3. Reyes SY, Serrato J, Sugita S (2013) Microstructural characterization of sanitaryware, the relationship spinel and mullite, Journal of Ceramic Processing Research 14, 4:492-497.
4. Zamorategui A, Alatorre A, Ibanez J, Garcia MG, Nosaka Y, Kobayashi T, Sugita S (2013) Thermodynamic and electrochemical study on the mechanism of formation of Ag(OH)4– in alkaline media, Electrochimica Acta 111:268–74.
5. Zamorategui A, Sugita S (2013) Effect of sulfate Ion on the γ-Al_2O_3 surface area synthesized by homogeneous precipitation, ARPN Journal of Science and Technology, 3, 5:485-91.
6. Zamorategui A, Martinez JM, Soto JA, Sugita S (2013) Ammonium bisulfite as a precipitant agent to synthesize pseudoboehmite (γ-AlOOH), International Journal of Engineering and Innovative Technology 3, 5:401-6.
7. Tovar-Carrillo KL, Sugita S, Tagaya M, Kobayashi T (2013) Fibroblast compatibility on scaffold hydrogels prepared from Agave Tequilana Weber bagasse for Tissue Regeneration, Ind. Eng. Chem. Res. 52, 33:11607–11613.

Biography

Satoshi Sugita has his expertise in ceramic powder processing. His homogeneous precipitation method to prepare the precursors of ceramic powders provides the opportunity to obtain nano-sized basic metal salts, which converts easily soft agglomerated ceramic powders, i.e. nano fibrillar γ-alumina, spherical α-alumina, spherical and fibrous mullite, etc. With this homogeneous precipitation, ammonium bisulfite is used as precipitant, and the control of the reaction conditions are very simple. This technique has the great possibility of preparing different types of ceramic powders.

satoshi@ugto.mx

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