

SPS as a tool of new materials

Kazuyuki Kakegawa

Chiba University Graduate School of Technology, Japan

SPS is a sintering method similar to hot pressing. Powdered samples are heated with uniaxial pressure. The difference is that SPS uses pulse direct current. SPS sinters many materials much faster than hot pressing. In the early days, researchers believed that spark plasma caused by the pulse direct current enhanced the sintering behavior. This is the origin of the name of SPS: Spark plasma sintering. Recently, many people do not believe the existence of spark plasma and call this method in different ways. Some people use the term, “SPS” instead of “spark plasma sintering”. Other people use “PECS”, an abbreviation of “pulse electric current sintering”. Anyhow the ability of SPS is very high. Because SPS sinters many materials at lower temperatures and within shorter periods, initial particle size can be maintained. This is a great advantage for sintering nanomaterials. SPS can also fabricate a material having its initial compositional distribution. This enables a combination of properties of different compositions. Examples of these results will be shown.

There are many materials which need high temperature for densification even by SPS. Although increase in the pressure of SPS is effective to lower such temperature, high pressure is not available for ceramic materials. Graphite die is used for sintering ceramics, because of the range of the sintering temperature of them. Graphite die is too weak for the high pressures. Methods to enable high pressure SPS were developed by researchers including us. Such methods will be shown in this presentation.

Biography

Kazuyuki Kakegawa is a Professor of Chiba University. He was graduated from Chiba University. He got doctorate from Tokyo Institute of Technology. He is now a Director of The Society of Inorganic Materials, Japan, chair of its academic committee and a member of its editorial boards. He is also a member of publishing committee, a secretary of Kanto branch and electronic division of The Ceramic Society of Japan. He is on editorial board of some international journals.

kake@faculty.chiba-u.jp

Nanoporous silica-magnetic nanoparticles composite: An efficient and magnetically recoverable catalyst for the synthesis of propargylamines

Lakshi Saikia, Dignata Bhuyan, Mrinal Saikia and Dipak Kumar Dutta

CSIR-North East Institute of Science and Technology, India

Magnetic nanoparticles are a class of nanostructured materials of current interest, due to their advanced technological and medical applications. Among the various magnetic nanoparticles, Fe_3O_4 nanoparticles are arguably the most extensively studied. Different methods have been developed for the preparation of magnetite nanostructure. In recent times, environmentally benign and efficient process for catalyst separation plays an important role in safety and environment point of view. The separation of magnetic catalyst from the reaction mixture is more effective as well as prevents the loss of catalyst. Various strategies have successfully demonstrated the applications of Fe_3O_4 nanoparticles immobilized or supported catalysts. In the present work, the catalytic activity study of mesoporous silica and magnetic iron oxide nanoparticles composite was carried out for three-component coupling of aldehyde, alkyne, and amine (A^3 -coupling) for the synthesis of propargylamines (yield about 75%). Different loadings of magnetic nanoparticles exhibit influence on yield of the product. The catalyst is easily separable from the reaction mixture and can be reusable for several times. The synthesized composite was characterized by XRD, HR-TEM, FT-IR, and TG-DTA.

Biography

Lakshi Saikia has completed his Ph.D. in 2008 from National Chemical Laboratory, Pune, India on synthesis and catalytic activity studies of functionalized mesoporous materials and after that joined CSIR-North East Institute of Science and Technology, Jorhat, India as junior scientist in the same year. He has published 14 papers in reputed journals, presented about 10 papers in conference and is also serving as an editorial board member of Modern Research in Catalysis.

l.saikia@gmail.com