OMICS Group Conferences
Accelerating Scientific Discovery

3rd International Conference on
Nanotek & Expo

December 02-04, 2013 Hampton Inn Tropicana, Las Vegas, NV, USA

Synthesis and application of crumpled graphene-encapsulated silicon nanoparticles

Hee Dong Jang[1], Hankwon Chang[1], Jiayan Luo[2] and Jiaxing Huang[2]
[1]Korea Institute of Geoscience and Mineral Resources, Korea
[2]Northwestern University, USA

Submicrometer-sized capsules made of Si nanoparticles wrapped by crumpled graphene shells were made by a rapid, one-step capillary-driven assembly route in aerosol droplets. Aqueous dispersion of micrometer-sized graphene oxide (GO) sheets and silicon (Si) nanoparticles were nebulized to form aerosol droplets, which were passed through a preheated tube furnace. Evaporation-induced capillary force wrapped graphene (a.k.a., reduced GO) sheets around the Si particles, and heavily crumpled the shell. The folds and wrinkles in the crumpled graphene coating can accommodate the volume expansion of Si upon lithiation without fracture, and thus help to protect Si nanoparticles from excessive deposition of the insulating solid electrolyte interphase. Compared to the native Si particles, the composite capsules have greatly improved performance as Li ion battery anodes in terms of capacity, cycling stability, and Coulombic efficiency.

Biography

Hee Dong Jang is currently a distinguished researcher and Director of Rare Metals Research Center of Korea Institute of Geoscience and Mineral Resources. He is also a Professor of University of Science and Technology. He received Ph.D. from Sogang University in Korea (1993), and Dr. Eng. from Hiroshima University in Japan (2005). He has been postdoc at the University of California at Los Angeles (1996-1997) and visiting scholar at the Northwestern University (2009-2010). He is currently a president of Korea Association for Aerosol and Particle Research (2012-present), and an Executive editor of Advanced Powder Technology (2009-present).

hdjang@kigam.re.kr