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Preparation of SiC nano-sized powder by using solid state reaction and plasma process

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Silicon carbide (ß-SiC) is a material used in advanced ceramic applications due to its high thermal conductivity, corrosion resistance, and strong mechanical property even at high temperature. Many methods have been used to produce SiC powders, such as carbothermal reduction, sol-gel, gas-phase reaction, solid state synthesis of silicon with carbon and so on. Among these methods, solid state synthesis of silicon with carbon can be considered to be an attractive method due to its proven advantages: Lower energy requirement, simpler and cheaper equipment. In this work, ß-SiC was synthesized by solid state method from the reaction of Si and C powder, and SiC nanoparticle was prepared from the synthesized fine SiC powder by DC thermal plasma reactor. Si powder of 99.5% purity with average size of 6 μm was mixed with activated carbon of average size 50 μm using ball milling. The mixture of Si and C were placed in a controlled atmosphere furnace at temperature of 1200°C. Two different atmospheres i.e., 100% Ar and 97% Ar and 3% H_2 were used to investigate the effect of H_2 gas on formation of SiC. It was found that H_2 gas lead to delaying the reaction time and lower particle size of SiC powder created. The surface areas of synthesized SiC powders were found to be 23.6 m2/g and 40.6 m2/s for 100% Ar atmosphere and H_2 atmosphere respectively. The particle size of SiC powder was reduced until 10-50 nm by DC thermal plasma treatment.

Biography

Changhyun Lee is pursuing his Master's degree in Department of Information and Electronics Materials Engineering, Jeonbuk National University. His research interest is mainly about the synthesis of Si/SiC and SiC for lithium ion battery.

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