

Simulation and Design High-temperature Microwave Furnace for Thermoelectric Material Synthesis

Thursday, May 21, 2015 1:00 PM (3h 30m)

The thermoelectric is a device that can generate electric energy from solar and waste thermal energies, and generate temperature gradient from electric energy for cooling applications. Recently, researchers are interested in the synthesis of thermoelectric material by microwave furnace. Because the performance of thermoelectric materials are increased by microwave assisted synthesis method because of rapid sintering as leading to small grain size. High-temperature microwave furnace technology is complicated in the design and control system. The commercial high-temperature microwave furnaces are very expensive. In this research, we will develop high-power microwave furnace for synthesis of thermoelectric materials. The design of microwave furnace is optimized by Comsol multiphysics modeling of wave field propagation in the waveguides and cavity. The waveguide modules are installed on all four sides of the square cavity. The microwave's door has chokes for microwave field leakage protection. The boundary conditions of waveguides and cavity are perfect conductor. The results show that a cavity size is 28x28x28 cm. and the waveguides are installed to the opposite angle of 90 degrees to each other. The distribution of high intensity microwave radiation in the middle of a cavity and low intensity in the waveguide. The configuration and dimension of the chokes are determined. The fabrication of the furnace is in progress.

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Session Classification: Poster-3

Track Classification: Material Physics, Nanoscale Physics and Nanotechnology