The Summer Undergraduate Research Fellowship (SURF) Symposium
6 August 2015
Purdue University, West Lafayette, Indiana, USA

Grain Boundary Migration of NiO-MgO Alloys

Xin Li Phuah, David Lowing, and John Blendell
School of Materials Engineering, Purdue University

ABSTRACT

Grain boundary engineering offers enhanced control of microstructure development during processing, leading to improved final material properties. However, using the effects of the interfacial energy anisotropy on grain boundary mobility to control microstructure development is not well understood. The NiO-MgO system is studied as it has complete solid solubility and a transition in the faceting behavior with composition due to changes in the interfacial energy anisotropy. NiO-MgO powders were produced through the amorphous citrate process and modifications to the process were made to reduce particle and agglomerate size. The powders were pressed and sintered in various conditions to produce fine grained high purity dense samples. Wet milling demonstrated a reduction in the overall particle and agglomerate size of the powders. Pressureless sintering showed an increase in the densification of the NiO-MgO compacts with increased heating rate. Wet milling and high heating rates produced near fully dense samples with relative apparent densities of >95% and open porosities <4% after sintering at 1500°C for 12h with a heating rate of 20°C/min.

KEYWORDS

Grain boundary, interfacial energy anisotropy, sintering, ball milling