2018

Comparative Study of the Microstructure and Mechanical Properties of Mechanically Alloyed and Spark Plasma Sintered AlxCoCrFeNi (0≤x≤2)High Entropy Alloys

David Mikhail
Cleveland State University

Comparative Study of the Microstructure and Mechanical Properties of Mechanically Alloyed and Spark Plasma Sintered AlxCoCrFeNi (0≤x≤2)High Entropy Alloys

Washkewicz College of Engineering

Student Researcher: David Mikhail

Faculty Advisor: Tushar Borkar

Abstract

High entropy alloys are a new class of material systems that have promising potential in high temperature structural applications. Mechanical alloying (MA) has gained special attention as a powerful non-equilibrium process for fabricating amorphous and nanocrystalline materials, whereas spark plasma sintering (SPS) is a unique technique for processing dense and near net shape bulk alloys with homogenous microstructure. This research paper discusses novel mechanically alloyed followed by spark plasma sintering approach for assessing composition-microstructure-microhardness relationship in AlxCoCrFeNi (0≤x≤2) high entropy alloy as a candidate system. With increasing Al content, there was a gradual change from a fcc-based microstructure to a bcc-based microstructure (including the ordered B2 phase), accompanied with an increase in microhardness. Such graded alloys are highly attractive candidates for investigating the influence of systematic compositional changes on microstructural evolution and concurrent physical and mechanical properties in complex concentrated alloys or high entropy alloys.

**Supported by the McNair Scholars Program*