

Fabrication of High-Entropy Alloys by Spark Plasma Sintering for Nuclear Applications

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High-entropy alloys (HEA) are novel and promising structural materials for fast neutron reactor systems. In this study, HEA have been fabricated by spark plasma sintering (SPS) after mechanical alloying. The effect of powder processing and SPS parameters on the microstructural formation in CoCrFeNi HEA has been investigated. CoCrFeNi HEA have a single-phase face-centered cubic (FCC) structure and a homogenous distribution of four metal elements. The mechanical alloying powders have a mixture of FCC and body-centered cubic (BCC) phases, which is transformed to FCC phase after SPS at 900 to 1000 °C. CoCrFeNi HEA fabricated from MA powders have a smaller grain size and higher concentration of chromium- and oxygen-rich precipitates than those fabricated from gas-atomized powders, resulting in a higher hardness.