

عنوان مقاله:

Mechanical Alloying and Spark Plasma Sintering of Equiatomic AlCoCrFeMnNi High Entropy Alloy

محل انتشار:

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خلاصه مقاله:

In this research, a high entropy alloy of AlCoCrFeNiMn is made through mechanical alloying and the spark plasma sintering processes. Ball milling was done at different times of ۱۲ h, ۳۶ h, and ۴۸ h in a cup with a diameter of ۲۰ cm. Ball to powder percent weight of ۱۰:۱ was selected. X-ray diffraction patterns indicate the formation of solid solution microstructure after ۴۸ h. The crystal size decreases from ۲۳ to ۱۶ nm with increasing milling time. The lattice strain of the structure increments from ۰.۳ to ۰.۶۸% with increasing time up to ۴۸ h. SEM images clearly show the phenomenon of powder agglomeration and the absence of intermetallic compounds or brittle, complex structures. It is observed that with increasing ball-milling time, homogenization of powders increases, and the body-centered cubic phase is formed in the structure. The mechanically alloyed powders were consolidated spark plasma sintered at ۷۰۰, ۹۰۰, and ۱۰۰۰ °C. ۵۰ MPa pressure, argon gas as atmosphere, and ten minutes as sintering time were selected as the sintering process parameters. The X-ray diffraction pattern shows that the structure of consolidated high entropy alloy has face-centered cubic and body-centered cubic phases. After sintering by the spark plasma method, the density of powders was measured by Archimedes' rules, and the value was determined as ۹۹% of theoretical density. The structure was without porosity. The hardness was measured using the microhardness Vickers test. Loading force was ۵۰ g and loading time was seven seconds. The highest hardness was about ۶۴۹ HV_{۰.۰۵}.

کلمات کلیدی:

AlCoCrFeNiMn high entropy alloy, mechanical alloying, Spark Plasma Sintering

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