High Entropy Alloys Prepared by Combination of Mechanical Alloying and Spark Plasma Sintering

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High entropy alloys belongs to quite novel materials that are attracting far more attention throughout the entire materials research. They are characterized by wide range of unique properties e.q. ultra-high strength while maintaining its ductility, good corrosion resistance, wear resistance, thermal stability, magnetic properties and many others. Generally, they are composed at least by five elements with nearly eqiatomic compositions that are further characterized by high mixing entropy allowing only formation of solid solutions. The investigated CoCrFeNiMn high entropy alloy was prepared by powder metallurgy processes combining the mechanical alloying with high-tech compaction via spark plasma sintering. The microstructure of prepared compact alloy was examined by the optical microscopy and electron scanning microscopy with EDS detector. The chemical and phase composition was determined by the results of the XRF analysis and by X-ray diffraction analysis. Prepared alloy reached ultra-high compressive yield strength of 1570 MPa and hardness 352 HV 30 outperforming the cast alloy with identical chemical composition that reached only 230 MPa and 120 HV 30, respectively.

Keywords: Mechanical alloying; microstructure; hardness; high entropy alloys.

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