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Influence of heat-treatment on microstructure and hardness of $Al_{0.5}Cr_{0.5}Ni_{0.5}TiZr_{1.5}Nb_{1.5}$ high entropy alloy

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High entropy alloys (HEA) are a new class of multicomponent alloys that contain 5 to 13 elements in equimolar or near equimolar ration. These types of alloys can develop superior properties like: high temperature stability, high hardness, high corrosion resistance etc.

Depending on the composition and the synthesis technique, HEA properties can vary and permanently change in particular conditions. High entropy alloy was synthetized by induction melting in argon atmosphere from high purity metal chunks. During the melting process temperature of 1900°C was reached. The melt was cast in a copper mould in argon atmosphere and slowly cooled. Resulted ingot was cleaned and analysed by Inductively coupled plasma - optical emission spectrometry (ICP-OES) and Scanning Electron Microscopy (SEM).

A piece of the HEA ingot was prepared for heat treatment process. Heat treatment of HEA in argon atmosphere at 900° C for 10 hours reveals a growth of the dendritic structure and a closing up of the inter-dendritic zones. The hardness of the alloy is increasing from the heat-treatment process due to formation of hard bcc structures.

SEM study highlighted the sample morphology and the differences appeared due to the modification of the structure by heat treatment, under controlled conditions. Also, by the Energy

Dispersive X-Ray Spectroscopy (EDS) technique, the component chemical elements of the obtained phases were observed.

Keywords: *EDS, SEM, ICP-OES, HEA.*

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Not applicable.

Conflicts of Interest

The authors declare no conflict of interest.

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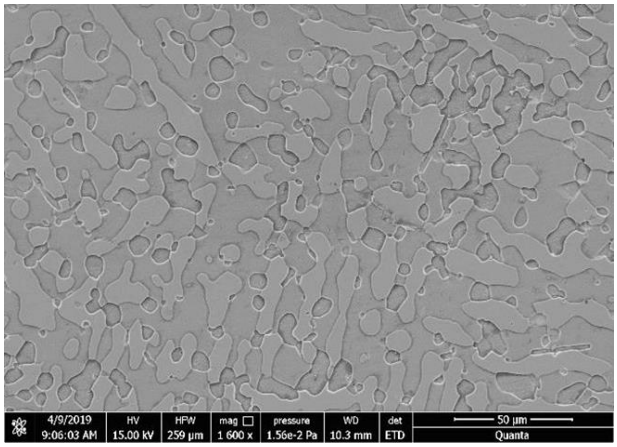

Figure 1. HEA microstructure of as-cast sample.

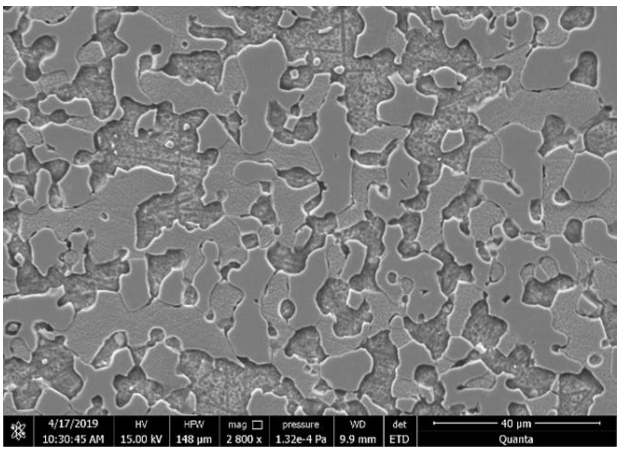

Figure 2. HEA microstructure after heat treatment at 900°C for 10h.

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