NanoMedicine 2019

NanoMedicine International Conference and Exhibition 2019

23 - 25 October 2019 | Lisbon, Portugal

NanoMed 2019

NanoMedicine International Conference 2019

Since the advent of nanotechnology, there has been a tremendous growth in this field of nano-bio-technology. Many products introduced into the market are based on nano-bio-technology and are useful to environment monitoring, rapid diagnostics, diseases monitoring, diseases management, and personalized health care. The ultimate aim of this approach is to make a better and healthier tomorrow for everybody. **NanoMedicine 2019** will cover the most recent International developments in the field of Nanobiotechnology and Nanomedicine. Participants will get a complete overview on the state of the art in these fields and on the research carried out and the latest results. Recent advances, difficulties and breakthroughs as well as emerging and future trends of the converging fields of Nanotechnology, Biotechnology and Medicine will be discussed. The event offers to the participants from both science and industry the opportunity to discuss new cooperation projects.

Effects of Nickel Content on the Microstructure, Microhardness and Corrosion Behavior of High-entropy $AlCoCrFeNi_x$ Alloys

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Abstract:
The pioneering efforts in obtaining the high entropy alloys (HEAs) created the groundwork for a new concept in alloy design by finding new equiatomic combinations of elements for advanced materials with unique properties.
In this study we investigate the effect of different nickel concentration on the microstructure, hardness and corrosion properties of high entropy alloys from AlCrFeCoNi system.
The analyzed HEAs were $AlCrFeCoNi_x$ with x=1; 1.4 and 1.8. These alloys were obtained by vacuum arc remelting from raw materials with high purity.
The microscopy examination has revealed the dendritic morphology for the reference alloy (AlCrFeCoNi) and the increase of the width of the interdendritic zones by increasing the nickel concentration while Cr is segregated in the interdendritic regions more than in dendrites.
Hardness values decrease with increasing the percentage of nickel because of the dissolution of precipitates in a nickel rich matrix and in consequence forming continuous solid solutions.
The corrosion properties of the HEAs were evaluated using a potentiodynamic polarization method. The alloys were immersed in SBS (Simulated Body Fluid) during one week and the corrosion parameters were registered. The low corrosion rates, low corrosion currents and high polarization resistance attest the good stability of HEAs in simulated biological environment.

Keywords: high entropy alloys, nickel, corrosion resistance, corrosion currents, polarization resitance, passivation, Ringer solution.

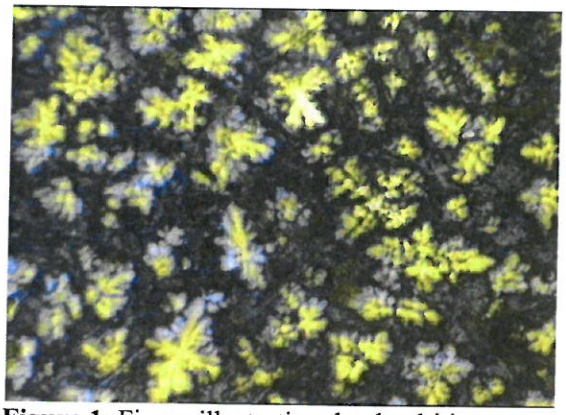

Figure 1: Figure illustrating the dendritic mor - phology of high-entropy $AlCrFeCoNi_{1.4}$ alloy after electrochemical etching in oxalic acid 10% for one minute.

References:

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SPECIMENS PREPARATION

The pioneering efforts in obtaining the high entropy alloys (HEAs) created the groundwork for a new concept of solid solutions multi-principal element alloys with unique properties at the nanoscale. In this study we investigate the effect of different nickel concentration on the microstructure, hardness and corrosion properties of high entropy alloys from AlCrFeCoNi system.

COMPONENTS	HEA 1	HEA 5	HEA 6	HEA 12	HEA 14
	AlCrFeCoNi	$Al_{0.5}CrFeCoNi$	$Al_{0.6}CrFeCoNi$	$AlCrFeCoNi_{1.4}$	$AlCrFeCoNi_{1.8}$
Al, wt%	10,67	8,72	6,68	9,76	8,99
Cr, wt%	20,55	21,00	21,47	18,8	17,32
Fe, wt%	22,13	22,61	23,12	20,24	18,65
Co, wt%	23,32	23,82	24,36	21,33	19,65
Ni, wt%	23,33	23,85	24,36	29,86	35,38

Nanometric image of HEA1 surface after fracture (Scanning Electron Microscope)

TESTS AND RESULTS

METALLOGRAPHY

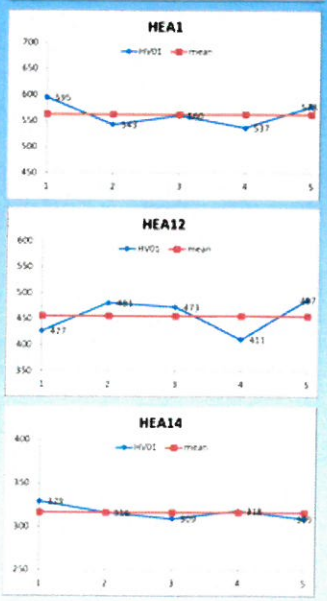
HEA1

HEA12

HEA14

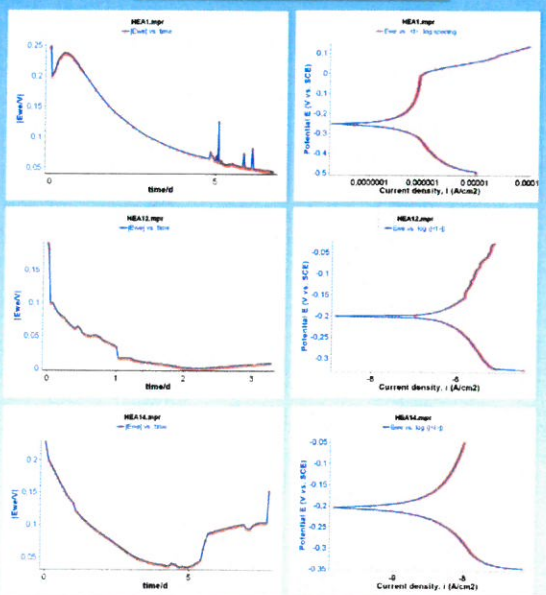
The microscopy examination reveals dendritic morphology for the reference alloy (AlCrFeCoNi) and the increase of the width of the interdendritic zones by increasing the nickel concentration.

HARDNESS



Hardness values decrease with increasing the percentage of nickel because of the dissolution of precipitates in a nickel rich matrix and in consequence forming continuous solid solutions.

CORROSION



The alloys were immersed in SBS (Simulated Body Fluid) during one week. The low corrosion rates, low corrosion currents and high polarization resistance attest the good stability of HEAs in simulated biological environment.