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ADVANCED HIGH ENTROPY MATERIALS

Abstracts of the IV International Conference
and School of Young Scientists
"Advanced High Entropy Materials"

Chernogolovka, Russia,
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STRUCTURE AND PRACTICAL OF WELD CLADDING OF THE NON-EQUIATOMIC Al-Co-Cr-Fe-Ni HIGH-ENTROPY ALLOY SYSTEM ONTO ALUMINUM ALLOY A5083

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Aluminum and its alloys have many applications because of their low density, high specific strength, and good atmospheric corrosion resistance. However, they have poor wear resistance, which could lead to shorter life of components due to damage. Coatings can improve tribological characteristics of the aluminum parts and prolong their performance duration. Nowadays, there are few methods that can be used for coatings' deposition on aluminum alloys: thermal spray processes (such as cold spraying, plasma spraying and high-velocity oxyfuel spraying), weld cladding (cold metal transfer and laser cladding) and combination of methods (cold spray + laser melting).

High-entropy alloys (HEAs) have many promising properties as coatings on aluminum alloys. HEAs are alloys in general consist of five or more principal elements with the content of each component varying from 5 to 35 at. %. Some HEA-systems as Al-Co-Cr-Fe-Ni reveal high hardness, good wear and corrosion resistance that makes them attractive as defense coatings.

This study showed the possibility to fabricate wear resistant coating from Al-Co-Cr-Fe-Ni high-entropy alloy onto A5083 aluminum substrate via weld cladding. The following results could be drawn:

1. The obtained coating has poor cohesion with the substrate and visible cracks on the surface and inside layers which formed during solidification.

2. The coating has the microhardness 6 times higher than that in the substrate and the wear rates comparable to the other coatings from high-entropy alloys obtained in the previous studies.

3. The chemical elements' distribution inside the layer is quite homogeneous and the microstructure represents matrix and the second phase with the size of 4 ± 2 μm. The microstructure of the substrate near to the boarder with the clad coating has star-shaped and needle-shaped grains with the sizes of 4.4 ± 0.1 μm and 3.2 ± 0.2 μm, consequently.

Although the obtained high-entropy alloy coating has poor cohesion with the aluminum alloy substrate, the method has showed its applicability. Therefore, the future investigations should be focused on the searching those compositions of the high-entropy coatings that will form FCC crystal structure and better dilute with the substrate.

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