

A FRESH PERSPECTIVE ON MEDIUM ENTROPY ALLOYS APPLICATIONS AS COATING AND COATING SUBSTRATE

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Abstract. In order to evolve as a society we need increasingly efficient technologies and implicitly materials with great performance that promote safety and sustainability. The discovery of high entropy alloys was received with much enthusiasm due to the possibility of designing new materials with improved properties, that could be used in applications that require extreme conditions or a very specific combination of properties. As the research in this area is continuously increasing and the results are very promising, this review focuses on the most recent investigations on medium entropy alloys (MEAs) applications, highlighting their properties, but taking into consideration other factors, such as economic and environmental factors. Additionally, considering the high cost associated with MEAs fabrication, MEA coatings are also explored, as they are nowadays regarded as a more convenient procedure to obtain the required properties for various substrate materials.

Keywords: medium entropy alloys, MEA applications, MEA structural material, MEA coating, MEA biomaterial.

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1. Introduction

Around twenty years ago, in 2004 [1,2], a new class of alloys was introduced, marked by an increase in the number of alloying elements. It was hypothesized that when the entropic contribution to the total free energy overcomes the enthalpic value, the formation of intermetallic phases is suppressed. According to thermodynamics, for an alloy to form a solid solution, the Gibbs free energy of the system should be at a minimum value and when the Gibbs free energy approaches zero, this high-entropy effect stabilizes the system [3], thus reducing the number of phases. Based on this idea, high entropy alloys (HEA) were initially defined as alloys formed with at least five principal elements in equiatomic or near-equiatomic proportions that form single-phase solid solutions and the medium entropy alloys (MEA) as their counterparts with lower entropy. However, the

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