ELECTRODEPOSITED HIGH ENTROPY ALLOYS: EFFECTS ON SURFACE PROPERTIES AND STRUCTURAL INTEGRITY

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ABSTRACT
High-entropy alloys (HEAs) have emerged as a novel class of materials with superior mechanical strength, corrosion resistance, and thermal stability. Among various fabrication techniques, electrodeposition has gained prominence due to its cost-effectiveness and ability to produce uniform coatings. This review explores the fundamentals of HEA electrodeposition, emphasizing the effects of key parameters such as bath composition, current density, and deposition potential on coating characteristics. The distinction between direct and pulse electrodeposition methods is examined, highlighting how pulse techniques enhance microstructural refinement and mechanical integrity. Furthermore, recent advances in composite HEA coatings, which integrate ceramic phases to improve durability and wear resistance, are discussed. Despite the advantages of electrodeposition, challenges such as achieving precise control over phase composition and reducing the environmental impact of electrolytes remain. Future studies should focus on optimizing deposition conditions and expanding the range of alloying elements to tailor HEA properties for specific engineering applications. The integration of computational modeling and real-time characterization techniques will further aid in predicting and refining deposition outcomes, paving the way for innovative HEA coatings with enhanced functionality.
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