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铅铋环境下耐腐蚀涂层的制备和性能评估

摘要

铅冷快堆使用具有更高安全性的液态铅铋合金作为冷却剂，是颇具发展前景的先进四代堆型。本研究围绕耐铅铋腐蚀涂层，在奥氏体不锈钢基体上开展硅铬共渗涂层、司太力合金涂层、激光熔覆 Ti3SiC2 涂层的制备，分析其组成成分和微观结构。开展涂层的铅铋腐蚀实验，分析其结构完整性、力学性能、表面氧化层及物相组成变化。通过微观结构和力学性能表征，评估不同种类涂层的耐铅铋腐蚀性能，从而为铅铋快堆的工程应用提供理论支撑和技术支持。

关键词

涂层；硅铬共渗；铅铋腐蚀；

Abstract

The lead — bismuth fast reactor uses liquid lead — bismuth alloy as the coolant, which has high safety and promising development prospects as Generation Ⅳ.In this study, we mainly focus on the lead — bismuth corrosion resistant coatings. The chromosiliconizing coatings, the Stellite alloy coatings and the laser cladding Ti3SiC2 coatings are prepared on the austenitic stainless steel substrates, whose composition and microstructure are analyzed. The lead — bismuth corrosion resistance experiment of the coatings is carried out to analyze its structural integrity, mechanical properties, surface oxide layer, and phase composition changes. The lead — bismuth corrosion resistance of the different types of coatings is evaluated by characterizing the microstructure and mechanical properties to provide theoretical and technical support for the engineering application of the lead — bismuth fast reactors.

Keywords

coatings; chromosiliconizing; lead — bismuth corrosion

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