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快报

铀表面离子注入碳改性层抗腐蚀性研究

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摘要 研究了碳在铀表面注入、梯度注入、反冲注入及离子束辅助沉积改性工艺。采用俄歇电子谱仪（AES）分析碳改性层沿深度方向的成分分布；采用X射线衍射仪（XRD）分析改性层的结构；通过动电位极化曲线、极限湿热腐蚀实验，比较腐蚀前后样品表面的形貌变化，对改性层抗腐蚀机理进行探索。研究结果表明：几种改性工艺均实现了碳离子在铀表面的注入或沉积，碳离子注入可在铀的表面形成碳化铀；45 keV能量辅助轰击沉积碳、50 keV能量及梯度能量碳离子注入改性层的抗腐蚀性能较优，先离子溅射沉积再碳离子辅助沉积形成的改性层的抗腐蚀性能最差。改性层腐蚀以点蚀为主，样品的腐蚀呈现在腐蚀点向基体和周围扩展，改性层致密无缺陷的区域则未发生腐蚀。

关键词

铀；碳；离子注入；辅助沉积；腐蚀

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Corrosion Resistance of Uranium With Carbon Ion Implantation

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Abstract The carbon modified layers prepared on uranium surface by carbon ion implantation, gradient implantation, recoil implantation and ion beam assisted deposition process techniques were studied. Depth profile elements of the samples based on Auger electron spectroscopy, phase composition identified by X-ray diffraction as well as corrosion resistance of the surface modified layers by electrochemistry tester and humid- thermal oxidation test were carried out. The carbon modified layers can be obtained by above techniques. The samples deposited with 45 keV ion bombardment, implanted by 50 keV ions and implanted with gradient energies are of better corrosion resistance properties. The samples deposited carbon before C+ implantation and C+ assisted deposition exhibit worse corrosion resistance properties. The modified layers are dominantly dot-corraded, which grows from the dots into substructure, however, the assisted deposition samples have comparatively high carbon composition and are corraded weakly.

Key words uranium _ carbon _ ion implantation _ assisted deposition _ corrosion

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