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TiO_2-K_2SiO_3无机涂层对空间材料Ag的防护行为研究

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摘要 在微波电离型原子氮（AO）源地面模拟设备中对空间材料Ag及TiO_2- K_2SiO_3无机涂层进行原子氧剥蚀效应试验。用扫描电镜（SEM）、光电子能谱（ XPS）、红外光谱（FT-IR）、X射线衍射光谱（XRD）和LAMBDA-9分光光度计，对在 模拟原子氧（AO）环境中Ag及在其表面涂覆的无机涂层，所发生的侵蚀与防护作用进行了表征研究。AO对Ag表现了较严重的侵蚀作用，原来光亮如镜的表面形貌变得 粗糙，且失去光泽。而所施用的TiO_2-K_2SiO_3无机涂层，经AO辐照后，表面形貌 则变化甚少。实验表明，该涂层对AO辐照有较强的防护效果、较好的空间稳定性（ AO辐照前后$\Delta\alpha \approx 0.024$），能阻止AO对基材的侵蚀。

关键词 氧化钛 硅酸钾 氧 稳定性 扫描电子显微镜 X射线光电子谱法 红外分光光度法 X射线衍射分析

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Study on the Protection of TiO_2-K-2SiO_3 Inorganic Coatings for Ag Used in Space

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Abstract TiO_2-K-2SiO_3 inorganic coatings were prepared and the factors that influenced their properties were described accordingly. The experiments to assess the properties of TiO_2-K-2SiO_3 coatings on silver (Ag has many applications in aerospace technology as solar cell interconnects) for anti-AO effects were carried out and the coatings with and without exposure to AO impingement from ground-simulation were also studied. Fourier transform infrared spectroscopy (FT-IR), X- ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD), LAMBDA-9 spectrophotometer, and scanning electron microscopy (SEM) were used to characterize the chemical and physical changes of the surfaces of unprotected and protected Ag samples. The results indicate that Ag is susceptible to AO erosion, presents mass loss and surface degraeation. TiO_2-K-2SiO_3 inorganic coatings have excellent properties for anti-AO effects and good stablility for space environment.

Key words TITANIUM OXIDE POTASSIUM SILICATE OXYGEN STABILITY SEM XRD IR XRD

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