

技术及应用

## 聚丙烯酸钐/环氧树脂辐射防护材料的制备工艺及性能

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收稿日期 修回日期 网络版发布日期:

**摘要** 通过辐照接枝聚合的方法制备聚丙烯酸钐/环氧树脂辐射防护材料和聚丙烯酸钐/丙烯酸铅/环氧树脂辐射防护材料, 研究不同剂量 $\gamma$ 射线照射下样品的性能差异和不同金属浓度样品的性能差异, 并比较钐元素和铅元素对光子的屏蔽能力。采用X射线衍射(XRD)、傅里叶变换红外光谱(FT-IR)、扫描电镜(SEM)、能量色散型X射线能谱(EDAX)等方法研究了材料的微观结构; 对材料的力学性能进行了测试和分析; 用多道 $\gamma$ 谱仪和GammaVision软件测试并分析了材料的辐射防护性能。结果表明: 复合材料较纯环氧树脂力学性能得到了改善; 材料制备过程中 $\gamma$ 射线的照射剂量控制在50 kGy左右为宜; 稀土元素钐防护低能射线的能力强于传统的屏蔽元素Pb。

关键词 [稀土元素](#) [接枝共聚](#)  [\$\gamma\$ 辐照](#) [屏蔽性能](#) [吸收边](#)

分类号

## Preparation and Property of Polyacrylic Acid Samarium/Epoxy Resin Composite Material for Radiation-Protection

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**Abstract** Polyacrylic acid samarium/epoxy resin composite material was prepared for radiation-protection via graft copolymerization route induced by gamma radiation. The samples under different dose and samples of different metal concentration were studied. The radiation-shielding abilities of Sm and Pb were compared. The composite material's microstructures were studied by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR), scanning electron microscope (SEM) and energy dispersive X-ray spectroscope (EDAX). Mechanical property of the material was also tested and analyzed. Gamma energy spectrum system and GammaVision software were used to calculate its radiation shielding property. The results indicate that the mechanical property of material is better than that of pure epoxy resin. The suitable dose for the process of inducing gamma irradiation is 50 kGy. For the low energy photon, the radiation-shielding ability of element Sm is better than that of element Pb.

**Key words** [rare earth element](#) [graft copolymerization](#) [gamma radiation shield capability](#) [absorption edge](#)

DOI

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