

技术及应用

基于 ^{63}Ni 辐伏同位素电池原型封装可靠性研究

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收稿日期 修回日期 网络版发布日期:

摘要 以加载有 ^{63}Ni 源片的GD3217Y型探测器为处理件, 在完成对封装材料的配方选择、灌注工艺、流程的制定并得到具有较好工艺性的灌注条件的基础上, 分别对原件、加载不锈钢圆片器件、加载电镀 ^{63}Ni 不锈钢圆片器件进行非放、放射灌注封装。在对灌件可靠性进行检测的基础上, 着重考察了原件、无/加载不锈钢圆片灌件、加载电镀 ^{63}Ni 不锈钢圆片灌件封装前后、自然老化及人工加速老化后电学输出特性, 即考察在 ^{63}Ni 源持续辐照下, 灌料、 ^{63}Ni 源、不锈钢片、芯片以及其他部件构成的体系内部之间相互作用关系, 即封装件特殊要求——屏蔽性、时效性。研究表明, 对以上结构的GD3217Y型探测器组件采用该种封装方式后除改善探测器组件的环境适应性, 特别是在保证放射源使用安全性的基础上具有较为稳定的电学输出性能, 这为辐伏效应同位素电池封装提供了参考。

关键词 [GD3217Y型探测器](#) [灌注](#) [自然老化](#) [加速老化](#) [电学性能](#)

分类号

Elementary Study on Encapsulation Reliability of Radioisotope Battery Prototype Based on ^{63}Ni Radio-Voltaic Effect

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Abstract For isotope battery application, it is necessary to encapsulate in a certain method. After having accomplished selection of material composing and proportion, procedure and encapsulating process based on GD3217Y detector, the different types of device come from untouched, loaded by slip of stainless steel with or without ^{63}Ni isotope were encapsulated respectively. Despite necessary reliability of package was evaluated in the previous work, in view of specialty due to the incorporation of radioactive isotopes into device, the reliability issue must be further taken into account for actual application. Hence, we emphasize on the comparison about electrical capability of types of devices under the different situations, namely, before and after encapsulation, the natural aging and artificial accelerated aging. The results of the comparison indicate that the adoption of the method of the encapsulation supplies effectively stable electrical capability at the condition of ensuring safety of radioactive source besides improving environmental adaptability for device. Further, it offers technological support for the encapsulation of radioisotope battery based on β radio voltaic effect.

Key words [GD3217Y detector](#) [encapsulation](#) [natural aging](#) [accelerated aging](#) [electrical capability](#)

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