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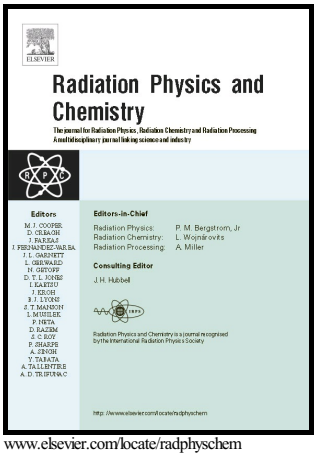

www.elsevier.com/locate/radphyschem

PII: S0969-806X(17)30023-3
DOI: http://dx.doi.org/10.1016/j.radphyschem.2017.07.023
Reference: RPC7600

To appear in: *Radiation Physics and Chemistry*

Received date: 8 January 2017
Revised date: 9 July 2017
Accepted date: 25 July 2017

Cite this article as: Mengge Dong, Xiangxin Xue, He Yang and Zhefu Li, Highly cost-effective shielding composite made from vanadium slag and boron-rich slag and its properties, *Radiation Physics and Chemistry*, http://dx.doi.org/10.1016/j.radphyschem.2017.07.023

Highly cost-effective shielding composite made from vanadium slag and boron-rich slag and its properties

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Abstract

Highly cost-effective shielding composite was prepared by vanadium slag, boron-rich slag and epoxy resin in this paper. WinXCOM program and ^{60}Co gamma ray source were used to analyze the gamma ray shielding properties. Gamma ray irradiation for composite was tested with ^{60}Co gamma ray irradiation field. Simultaneous DSC-TGA, electronic universal testing machine and scanning electron microscopy were used to analyze the material properties of composite. The *HVL* of all composites are nearly same for ^{60}Co gamma ray, about 3.90cm at 1173keV and 4.15cm at 1332keV. Maximum resistance temperature of composites is about 230°C. Bending strength of all composites is nearly same and more than 10MPa. Composites have good resistance for gamma ray irradiation effect under 93.5kGy dose gamma ray.

Keywords: vanadium slag; boron-rich slag; epoxy resin; gamma ray; shielding composites; irradiation

1 Introduction

As we all know nuclear facilities are widely used in radiation industry, nuclear medical and nuclear power stations etc. and bring many benefits for human [1-3]. However, neutron, gamma ray and X-ray are harmful for human, so effective shielding materials should be applied to shield harmful rays [4]. Pb-based materials are regarded as the most frequently-used shielding materials, but Pb element is poisonous [5-7]. Given this Pb-free shielding materials which contain W, Ba, Bi and other high-Z elements have excellent shielding properties were investigated to instead Pb-based shielding materials [8-13]. Furthermore, boron-containing materials are widely used in