Accepted Manuscript

Enhancing the neutron shielding ability of polyethylene composites with an alternating multi-layered structure

Xianlong Zhang, Mingtao Yang, Xiaomeng Zhang, Hong Wu, Shaoyun Guo, Yuzhong Wang

PII: S0266-3538(17)30585-7

DOI: 10.1016/j.compscitech.2017.06.007

Reference: CSTE 6802

To appear in: *Composites Science and Technology*

Received Date: 19 March 2017

Revised Date: 6 June 2017

Accepted Date: 11 June 2017

Please cite this article as: Zhang X, Yang M, Zhang X, Wu H, Guo S, Wang Y, Enhancing the neutron shielding ability of polyethylene composites with an alternating multi-layered structure, *Composites Science and Technology* (2017), doi: 10.1016/j.compscitech.2017.06.007.

Enhancing the Neutron Shielding Ability of Polyethylene Composites with an Alternating Multi-layered Structure

Xianlong Zhang[1], Mingtao Yang[2], Xiaomeng Zhang[1], Hong Wu[1*], Shaoyun Guo[1*], Yuzhong Wang[2]

1 The State Key Laboratory of Polymer Materials Engineering, Polymer Research Institute of Sichuan University, Chengdu 610065, China

2 College of Chemistry and Bioengineering，YiChun University, Yichun 336000, China

3 Center for Degradable and Flame-retardant Polymeric Material, Sichuan University, Chengdu 610064, China

Abstract

Neutron radiation is often encountered in a wide range of industries, such as aerospace, healthcare and nuclear power plants. It has been an arduous challenge to shield this neutron radiation to improve equipment safety and protect human health. In order to make an effective neutron shielding material, alternating multi-layered composites (high density polyethylene)/(high density polyethylene/boron nitride), (HDPE/(HDPE/BN)) and (HDPE/BN)/(HDPE/Barium sulfate ($BaSO_4$)) were fabricated using a multi-layered co-extrusion system. The HDPE/BN layers in the alternating multilayered HDPE/(HDPE/BN) and (HDPE/BN)/(HDPE/$BaSO_4$) composites had a continuous and layered distribution in their structure, with the BN particles oriented in the extrusion direction. The probability of collision between incident photons and flake-shaped particles is enhanced through alignment of the oriented BN particles. In this way, neutron transmittance noticeably decreased with an increasing number of layers. Compared to traditional polymer-blended materials, the

* To whom correspondence should be addresses. (Prof. Wu, Email: wh@scu.edu.cn, Fax: 86-028-85466077)
* To whom correspondence should be addresses. (Prof. Guo, Email: sguo@scu.edu.cn, Fax: 86-28-85405135)