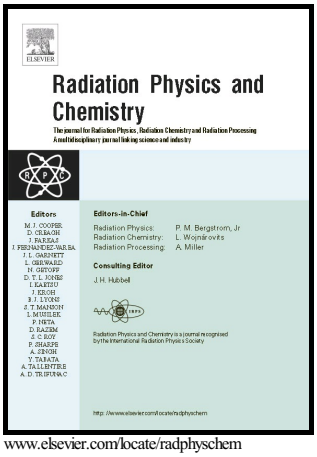
Author's Accepted Manuscript



www.elsevier.com/locate/radphyschem

Investigation on gamma and neutron radiation shielding parameters for $BaO/SrO–Bi_2O_3–B_2O_3$ glasses

M.I. Sayyed, G. Lakshminarayana, M.G. Dong, M. Çelikbilek Ersundu, A.E. Ersundu, I.V. Kityk

PII: S0969-806X(17)30591-1
DOI: https://doi.org/10.1016/j.radphyschem.2017.12.010
Reference: RPC7716

To appear in: *Radiation Physics and Chemistry*

Received date: 4 June 2017
Revised date: 4 November 2017
Accepted date: 10 December 2017

Cite this article as: M.I. Sayyed, G. Lakshminarayana, M.G. Dong, M. Çelikbilek Ersundu, A.E. Ersundu and I.V. Kityk, Investigation on gamma and neutron radiation shielding parameters for $BaO/SrO–Bi_2O_3–B_2O_3$ glasses, *Radiation Physics and Chemistry,* https://doi.org/10.1016/j.radphyschem.2017.12.010

Investigation on gamma and neutron radiation shielding parameters for $BaO/SrO–Bi_2O_3–B_2O_3$ glasses

M.I. Sayyed[a,*], G. Lakshminarayana[b,*], M.G. Dong[c], M. Çelikbilek Ersundu[d], A.E. Ersundu[d], I.V. Kityk[e]

[a]*Physics Department, University of Tabuk, Tabuk, Saudi Arabia*
[b]*Wireless and Photonic Networks Research Centre, Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia*
[c]*Department of Resource and Environment, School of Metallurgy, Northeastern University, Shenyang 110819, China*
[d]*Yildiz Technical University, Department of Metallurgical and Materials Engineering, Faculty of Chemical and Metallurgical Engineering, Istanbul 34220, Turkey*
[e]*Institute of Optoelectronics and Measuring Systems , Faculty of Electrical Engineering, Czestochowa University of Technology, 17 Armii Krajowej Str., 42-200 Czestochowa, Poland*

Abstract

In this work, mass attenuation coefficients (μ/ρ), effective atomic number (Z_{eff}), electron density (N_e), mean free path (MFP), and half-value layer (HVL) of 20 BaO/SrO–(x) Bi_2O_3–(80–x) B_2O_3 glasses (where x=10, 20, 30, 40, 50, 60 mol%) were calculated using WinXCom program and MCNP5 code. The obtained (μ/ρ) results using both MCNP5 code and WinXCom program were in good agreement. It is found that the addition of Bi_2O_3 leads to increase the Z_{eff} values in both $BaO/SrO–Bi_2O_3–B_2O_3$ glass systems. However, the Z_{eff} values of the $BaO–Bi_2O_3–B_2O_3$ glass system are higher than those of the $SrO–Bi_2O_3–B_2O_3$ glasses. The fast neutrons effective removal cross sections (Σ_R) for 20 SrO–40 Bi_2O_3–40 B_2O_3 glass is the highest among all studied glasses. The calculated half-value layer values were compared with different glass systems and it was found that the shielding properties of the selected glasses are comparable or even better than other glass systems such as phosphate glasses.

Keywords: Bismuth borate glasses; gamma-rays; neutron radiation; WinXCom; MCNP5 code; shielding properties