

Accepted Manuscript

Investigation of bismuth borate glass system modified with barium for structural and gamma-ray shielding properties

Parminder Kaur, K.J. Singh, Sonika Thakur, Prabhjot Singh, B.S. Bajwa



PII: S1386-1425(18)30808-4
DOI: doi:[10.1016/j.saa.2018.08.038](https://doi.org/10.1016/j.saa.2018.08.038)
Reference: SAA 16413

To appear in: *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*

Received date: 20 March 2018
Revised date: 16 August 2018
Accepted date: 20 August 2018

Please cite this article as: Parminder Kaur, K.J. Singh, Sonika Thakur, Prabhjot Singh, B.S. Bajwa , Investigation of bismuth borate glass system modified with barium for structural and gamma-ray shielding properties. Saa (2018), doi:[10.1016/j.saa.2018.08.038](https://doi.org/10.1016/j.saa.2018.08.038)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Investigation of Bismuth Borate Glass System Modified with Barium for Structural and Gamma-ray Shielding Properties

Parminder Kaur¹, K. J. Singh^{1*}, Sonika Thakur^{1,2}, Prabhjot Singh¹ and B.S. Bajwa¹

¹*Department of Physics, Guru Nanak Dev University, Amritsar-143005, India*

²*Department of Physics, Guru Nanak Dev University College Verka, Amritsar, Punjab 143501, India*

* E-mail- kanwarjitsingh@yahoo.com

Abstract

In the present paper, transparent and non-toxic Bi_2O_3 - B_2O_3 glasses doped with BaO have been prepared by the authors which may replace the standard radiation shielding concretes and lead based commercial glasses for gamma ray shielding applications. The effects of BaO on the structural and optical properties of the prepared glass system have been investigated by Raman, FTIR and UV-Visible techniques. It has been observed that barium plays the role of a modifier and it is responsible for conversion of triangular $[\text{BO}_3]$ units to tetrahedral $[\text{BO}_4]$ units along with formation of non-bridging oxygen and increase in ionic character. It also improves the radiation shielding abilities of the glass system. The mass attenuation coefficients for gamma-ray photons at 662 keV energy by using ^{137}Cs radioactive source have been measured by employing narrow beam transmission geometry. This was accompanied by theoretical computation of mass attenuation coefficients in the wide photon energy range varying from 1 keV to 100 GeV. It has been found that values of mean free path and tenth value layer decrease whereas, density and effective atomic number increase with the increase of barium oxide content. As compared with barite concrete and commercial shielding glass RS-360, our prepared Bi_2O_3 - BaO - B_2O_3 glasses have shown better gamma ray shielding properties. This implies that the prepared glass system is a better gamma ray absorber and it has the potential for use in gamma-ray shielding applications.

Keywords: Borate glasses; Radiation shielding; Tenth Value Layer; Structural properties

Download English Version:

<https://daneshyari.com/en/article/11005803>

Download Persian Version:

<https://daneshyari.com/article/11005803>

[Daneshyari.com](https://daneshyari.com)