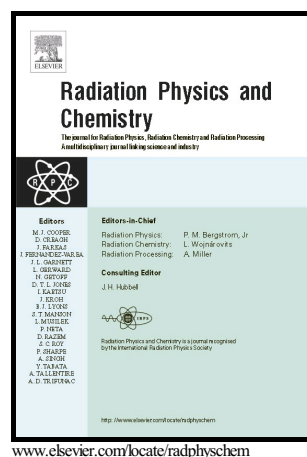


# Author's Accepted Manuscript

## MASS ATTENUATION COEFFICIENTS OF X-RAYS IN DIFFERENT BARITE CONCRETE USED IN RADIATION PROTECTION AS SHIELDING AGAINST IONIZING RADIATION

T. Airton Almeida Junior, M.S. Nogueira, M.A.P. Santos, L.L. Campos, F.G.S. Araújo



PII: S0969-806X(17)30252-9  
DOI: <http://dx.doi.org/10.1016/j.radphyschem.2017.02.054>  
Reference: RPC7456

To appear in: *Radiation Physics and Chemistry*

Received date: 30 September 2016  
Revised date: 23 February 2017  
Accepted date: 24 February 2017

Cite this article as: T. Airton Almeida Junior, M.S. Nogueira, M.A.P. Santos, L.L. Campos and F.G.S. Araújo, MASS ATTENUATION COEFFICIENTS OF X-RAYS IN DIFFERENT BARITE CONCRETE USED IN RADIATION PROTECTION AS SHIELDING AGAINST IONIZING RADIATION, *Radiation Physics and Chemistry*, <http://dx.doi.org/10.1016/j.radphyschem.2017.02.054>

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 galley proof before it is published in its final citable 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.

# MASS ATTENUATION COEFFICIENTS OF X-RAYS IN DIFFERENT BARITE CONCRETE USED IN RADIATION PROTECTION AS SHIELDING AGAINST IONIZING RADIATION.

**Almeida Junior, Airtton T.<sup>1,4,5</sup>, Nogueira, M. S.<sup>2,4</sup>, Santos, M. A. P<sup>3</sup>, L. L. Campos<sup>4</sup>, Araújo, F. G. S.<sup>5</sup>**

<sup>1</sup>Brazilian Institute for Safety and Health at Work – FUNDACENTRO, Minas Gerais, Brazil

<sup>2</sup>Center of Development of Nuclear Technology – CDTN/CNEN, Minas Gerais, Brazil

<sup>3</sup>Regional Center for Nuclear Science – CRCN/CNEN, Pernambuco, Brazil

<sup>4</sup>Institute of Energy and Nuclear Research – IPEN/CNEN, São Paulo, Brazil

<sup>5</sup>Universidade Federal de Ouro Preto – UFOP /REDEMAT, Minas Gerais, Brazil

## Abstract

The probability of a photon interacting in a particular way with a given material, per unit path length, is usually called the linear attenuation coefficient ( $\mu$ ), and it is of great importance in radiation shielding. Plates of barite concrete with different thickness were fabricated in order to determining their mass attenuation coefficients at different energies. The plates were irradiated with ISO X-ray beams (N60, N80, N110 and N150), generated by Pantak HF320 X-ray equipment, at the IPEN laboratory. The mass attenuation coefficients of barite concrete have been measured using X-ray attenuation for different thicknesses of barite concrete qualities of the ISO. The attenuator material issued from different regions of Brazil. The experimental procedure in this research was validated by comparison between the experimental measurements of mass attenuation coefficients and coefficients determined by the same atomic composition, using as a tool to XCOM. The highest value of ( $\mu/\rho$ ) found experimentally was in the energy of 48 keV, in ISO 60 N quality, being  $1.32(\pm 0.49)$  for purple barite;  $1.47(\pm 0.41)$  for white barite and  $1.75(\pm 0.41)$  for cream barite. The determination of the chemical composition of the barite samples was of fundamental importance for the characterization of these materials. It can be seen that both calculated and measured data for the linear attenuation coefficients increase with the increasing materials density, as it is expected. It can be concluded that the photon attenuation coefficients depends on the photon energy and the materials density is the main contribution to the photon attenuation coefficients, which is important for radiation shielding.

## Keywords

Barite concrete, Mass attenuation coefficients, radiation shielding

## Introduction

Concrete which contains water, cement and aggregate, is widely used in building constructions such as medical hospitals. The acknowledgement of the characteristics of attenuation of barite is fundamental, from the radioprotection point of view to the viabilisation, the design and the execution of projects of ionizing radiation shielding in radioactive facilities. Planning the appropriate shielding for nuclear centers depends on several factors such as the type of radiation, energy and cost. Mostly high atomic number and high density materials are used for this purpose; but the latter are costly, hence their use is limited. The use of ionizing radiation in medical and dental diagnosis is supervised by the sanitation department in both municipal and state levels, in accordance to rules established by the National Agency of Sanitary Supervision in Brazil - ANVISA. Moreover, The Ministry of Labour and Employment also inspects the

Download English Version:

<https://daneshyari.com/en/article/5499107>

Download Persian Version:

<https://daneshyari.com/article/5499107>

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