HETEROGENEOUS SYSTEM IN RADIATION PROTECTION

Iakubova K., Mazilov A.[1]

V.N. Karazin Kharkiv National University
School of Physics and Technology, Biological and Medical Physics Department
Ukraine, 61077 Kharkov, ploschad' Svobody 4, Tel.: (093) 528-24-19
E-mail: karina_iakubova@mail.ru
[1] The National Science Center Kharkov Physical-Technical Institute,
Ukraine, 61108, Kharkov, ul. Akademicheskaya 1, Tel.: (057) 335-63-45
E-mail: mazilov@kipt.kharkov.ua

In the present work the features of attenuation of gamma radiation from spent nuclear fuel fragment of a multilayer system of tungsten and aluminum is theoretically and experimentally investigated. General issues of passage of radiation from isotopic sources across heterogeneous environments are considered in [1-3].

The purpose of this study was to produce theoretical basis and experimental confirmation of the rational selection of a multilayer protection minimizes the intensity (flux, dose rate or dose) of gamma radiation. Investigated protection, consisting of two materials, particularly tungsten (W) and aluminum (Al), and combined in several ways: from a two-layer (one layer of W and one layer of Al) to the multilayer, provided an equal number of layers of either material.

It is shown that at the same multiplicity dividing the total thickness of the light and heavy materials that make up the defense, its efficiency is higher in the case of lightweight material facing the radiation source, and the effectiveness of the protection is maximal when one-period protection scheme. In the case of reciprocal orientations of the effectiveness of the protection is minimal. With increasing multiplicity of fission material thickness difference between the values of the protection of both variants of orientation decreases, asymptotically approaching a certain average value characteristic of a homogeneous mixture of materials.

The observed effect may find practical application in the design and layout of radiation protection photon energy region (100-150 keV), for example, to protect the X-ray rooms and other devices that generate X-rays.

References.

1. Belous VA, Komarov SA, Shilayev BA Protective thin-film multi-layer shields against X-ray and gamma radiation. - Problems of Atomic Science and Technology, 2008, № 1. Series: Pure materials, conductors (17), pp. 202-204.
2. Tikhonravov A.V. Some theoretical aspects of thin-film optics and their applications. / / Applied Optics 32, № 28, 1993, pp. 5417-5426.
3. Kozlov VF Handbook of Radiation Safety. 3rd ed., Revised. and add. – M.: Atomenergoizdat, 1987, 34 p.