

Shielding and dosimetry parameters for aluminum carbon steel
متغيرات الوقاية من الاشعاع وقياس الجرعات للفولاذ الكربوني والألومنيوم

A. Abdel-Latif M, Aliaa M Monazie, Ahmed M. Al Kaisy, A.F. Tawfic, Samah A. Al-Shelkamy

Applied Radiation and Isotopes 201 (2023) 111022
<https://doi.org/10.1016/j.apradiso.2023.111022>

Abstract

Aluminum is lightweight durable, versatile, non-toxic, and corrosion-resistant surface, which makes aluminum a perfect material for improving the corrosion properties of aluminum-carbon steel which is important in the radiation domain. In this study, six carbon steel alloys doped with different aluminum concentrations were studied and compared with the standard austenite stainless steel AISI316L. Different parameters for shielding and dosimetry such as mass attenuation coefficient, tenth value layer, mean free path, equivalent effective atomic and electronic numbers were calculated using WinXCom, while the exposure absorption buildup factors, thermal and fast neutron removal cross-sections were calculated using MCNPX and the effective conductivity was calculated using Phy-X/PSD program. Regarding the radiation shielding performance, the addition of aluminum to the carbon alloys has a significant influence on the shielding parameters. The results suggest that the addition of aluminum to the carbon steel alloys would improve its shielding properties so that it is a good result to be used in the field of dosimetry and radiation shielding.