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Research note

The effect of electron and gamma irradiation on the quality of surface and reflection of silver mirror coated by TiO_2 and Ta_2O_5

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Abstract

In this study, the effects of gamma and electron radiation on reflectivity of silver mirrors coated by TiO_2 and Ta_2O_5 , in the wavelength range 250 to 1100 (nm) has been investigated. The coatings are considered for space applications in LEO orbit at 500 (km) from the earth surface for three-year mission in space. Electron and gamma dose absorbed within the three-year are respectively about 7.5 (KGy) and 0.4 (KGy) in this orbit. To measure the resistance of TiO_2 , gamma radiation with CO60 irradiation source was applied on the sample in the range from 0.2 to 20 (KGy) including dose 400 (Gy) at the desired height. At the highest dose, 20 (KGy), radiation effects on both samples were compared with each other. The atomic force microscopy was used to investigate the effect of radiation on the quality of samples surface after radiation, and an spectrophotometer was used to measure the samples reflection before and after radiation. The results showed that in spite of very minor surface changes, and color change of the mirror substrate, its reflection remains unchanged with TiO_2 and Ta_2O_5 coatings.

Keywords: radiation effect, electron, gamma, silver mirrors, TiO_2 coating, Ta_2O_5 coating

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