

Structure and optical properties of thin Ta₂O₅/SiO₂ multilayer mirror prepared by ion beam sputtering

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Received 12.07.2024; revised 2.08.2024; accepted 12.12.2024

The use of mirror optics based on multilayer dielectric coatings is currently of significant interest for the design of radiation hardened optics. In this work, we tested the ion beam sputtering method to deposit an IR mirror based on the Ta₂O₅/SiO₂ pair on a fused quartz substrate. The obtained samples were studied with spectrophotometry in the visible and IR ranges, X-ray reflectometry and diffraction. As a result, it was shown that the applied method made it possible to obtain amorphous layers of Ta₂O₅ and SiO₂. For the achieved coating thicknesses and densities, the near-IR reflectance exceeded 99.9 %. In general, the results demonstrated that the complex diagnostic technique used can be useful not only for studying the structure and composition of such coatings, but also for indicating deviations in the shape of samples, for example, due to tensile mechanical stresses.

Keywords: dielectric thin films; ion sputtering; antireflective and mirror coatings.

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