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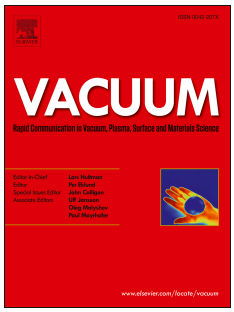

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Ion Assisted Deposition of Silica-Titania Multilayer Optical Filter for Beam Steering of Nd:YAG Laser

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Abstract- In the present study, a multilayer reflective optical filter consisting of 24 alternate layers of SiO_2 and TiO_2 was designed and fabricated on BK7 glass substrate using Ion Assisted electron beam Deposition (IAD) technique. The spectroscopic characterization of the filter was carried out in Vis-NIR range with Universal Measurement Accessory (UMA) to measure its optical performance at normal and oblique angles of incidences. The measurements confirmed the optical peak reflectance of more than 99.98% at design wavelength of Nd:YAG laser centred at 1064 nm. The tuning of refractive indices of the constituent layers during deposition resulted in a Full-Width at Half-Maximum (FWHM) bandwidth of 330 nm of the fabricated filter which enables its use at any angle of incidences between 0 - 60˚ for manipulating the laser beam. Qualitative assessment of the mechanical stability of the coated filter with respect to its adhesion and abrasion resistance was carried out in accordance with MIL-F-48616 and MIL-E-12397 respectively. The achieved optical performance of the coated filter is suited for beam steering and folding of high power laser beams for metal cutting, diamond processing and in other laser based material processing instruments.

Keywords: Optical Filters, Vacuum Deposition, Thin Films, Laser Instrumentation

1. Introduction

Laser filters are optical filters designed to transmit only a certain wavelength or range of wavelengths. They are usually used to isolate certain wavelengths by reflecting or absorbing unwanted wavelengths. Laser mirrors are the high reflection coatings designed for laser beam manipulation through beam steering and folding. Dielectric multilayer