Properties of highly transparent AlN/SiOx multilayer systems

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Abstract

The new generation of engineered materials is required to perform under extreme conditions of stress, temperature and irradiation, among others. Nano multilayer (NM) materials have been shown to be promising candidates to overcome current structural and functional limitations. To date, most of the studied NM systems are comprised of metal/metal layers, where the optical properties do not represent an area of interest. Therefore, in this work we extended the structural potential of metal/metal NM configurations to ceramic/ceramic NMs which display a broad range of properties but in particular, they offer the possibility to modulate the optical properties depending on their morphology, grain size, layer thickness, and composition. Three different systems composed of alternated layers of AlN and SiO_x were studied. For each sample, the number of layers and the individual thicknesses were varied until a total thickness of 1 μm was reached. The optical properties of the multilayers were determined using UV-Vis-NIR spectroscopy, revealing the formation of uniform and smooth interfaces with an average optical transparency above 80% that extends through the entire region. Furthermore, the microstructure and plastic behavior were also studied and correlated with the multilayer configuration of the synthesized systems.

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