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SiC Structural Analysis on Energized Microlamps in Micrometric Scale

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Abstract

This study presents the structure of a-SiC thin films on top of chromium microlamps, deposited to be a protection layer against oxidation, as well as their chemical and structural modifications induced by heating during operation. They were formed with materials deposited by plasma-enhanced chemical vapor deposition (PECVD) and sputtering, on silicon substrates. The SOLEIL synchrotron beamline, used in this work, has a microfocus beam, allowing the evaluation of the micro region thermally affected using XANES. The results showed structural changes in the a-SiC protective layer. To improve the studies additional a-SiC thin films, deposited on ordinary large flat substrates, were produced and analyzed by XANES, EXAFS, GIXRF, and RBS. The results revealed the diffusion of Cr and O into the a-SiC. In addition, from a-SiC atomic geometries obtained by ab initio molecular dynamics, it was also simulated the XANES spectra with the finite difference method near edge structure (FDMNES) code. The conclusion was that the microlamp design induced the growth

of a PECVD a-SiC layer far from the best conditions, probably due to the presence of a cavity under the filament, that reduced the substrate temperature during the deposition, enhancing the Cr and O diffusion into the silicon carbide.

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