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ABSTRACT:

Surface Finishing Improvement: SiC Thin Film Sputtered on SiC Substrate

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Thin and thick Silicon Carbide (SiC) films were deposited by sputtering on microscopy slides and SiC substrates. High-quality optical surface finishing was the main process goal [1]. Home-made target was produced using β-SiC, GRADE BF-17; PVal, Airvol 205, PVA (C2H4O)n, and distilled water. The RF Sputtering system, provided by PrestVacuo, had a base pressure of 4 x10-3 Pa. After Argon was inserted, the deposition pressure was 1 Pa. The other deposition parameters were 112 W, 5 – 7 cm target substrate distance, and 1 – 8 h deposition time.

The target DRX results presented α and β_SiC. Some SiC clusters could be observed on the film surfaces, probably due to the low target sintering temperature (900 ºC). The films were characterized by DRX, micro Hardness, Transmitance, Surface roughness, and AFM. The films were amorphous (X-Ray) and had thicknesses between 0.7 µm and 5.5 µm. All films showed lower roughness than the respective substrate. AFM results suggest the possible influence of the substrate on the morphological and topographic characteristics of the surfaces of the films since they were deposited under the same conditions and in the same experiment for both substrates (Sic and glass).

The 0.7 µm thick film showed similar transmission compared to the glass slide. It is a promising protective layer for optical applications. The 5.5 µm film on glass presented high absorption in the UV region, indicating possible use as a protection layer for this region [2].

[1] M.V.R. do Santos, “Silicon carbide optical finishing study for application in aerospace mirrors”. Doctoral Thesis, Aeronautics Technological Institute, ITA/DCTA (2023).

[2] T.A. Germer, J.C. Zwinkels, B.K.T Hardback, Spectrophotometry: Accurate measurement of optical properties of materials. Amsterdam: Academic Press,. v. 46, 576p. (2014). https://doi.org/10.1016/B978-0-12-386022-4.00006-6