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Thin Film Deposition of MAX Phase Nb-Al-C Compounds on Stainless Steel Substrates Using a Magnetized Sheet Plasma Source[1]

JANELLA MAE SALAMANIA, HENRY RAMOS, Plasma Physics Laboratory, National Institute of Physics, University of the Philippines - Diliman — Thin films of the Nb-Al-C system were deposited on stainless steel substrates through the magnetron sputtering mode of the Magnetized Sheet Plasma Facility from elemental source of Nb, Al metals and reactive gas CH_4. Niobium and aluminum targets were first sputtered using argon plasma and were deposited together with CH_4 gas onto the substrates. Various parameters such as target bias, time, filling pressure and extraction current were varied. Synthesized thin films were then characterized using X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray Spectroscopy (EDX) and Raman Spectroscopy. XRD spectra of the samples show that MAX phases of the Nb-Al-C family are present on the films, specifically, the 413 phase (Nb_4AlC_3). EDX and Raman spectra confirm the presence of the elemental niobium, aluminum and carbon in the films. Raman spectra show that excess carbon formed fine graphite crystallites. SEM surface images show that the resulting films follow the contours of the SS substrate. The cross-sectional images show micron scale thickness deposited above the SS substrates.

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