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Structural and optical characterization of Cr_{1-x}Al_x(O)N films prepared by HiPIMS

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Cr_{1-x}Al_x(O)N coatings were deposited by reactive magnetron sputtering on different substrates using high power impulse (HiPIMS) and DC sources. Different experimental conditions like nitrogen fluxes and pulse parameters were investigated in order to obtain variable chemical compositions and microstructure. Elemental compositions of these films were assessed by electron probe microanalysis and electron energy-loss spectroscopy (EELS). Scanning electron microscopy revealed a columnar film growth with variable topography depending on the synthesis parameters. X-ray diffraction and high-resolution electron microscopy studies allowed determining the crystalline phases present in the films while EELS spectroscopy gave information about the nature of the amorphous phases. Optical characterization of the films has been performed in the UV-VIS-NIR wavelength range. The oxidation resistance and long term thermal stability in air has been evaluated at 700°C on stainless steel. Different optical and thermal behaviours are obtained depending on the stoichiometry. The absorbance is also calculated in order to explore the use of these films as components for high temperature solar absorbers and solar selective tandem absorbers.

Keywords

CrALN(O)

Magnetron Sputtering

HiPIMS

Microstructural characterization

Thermal stability