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Influence of RF power on the stoichiometry, optical, and electrical properties of chromium oxide coatings prepared by reactive magnetron sputtering(Article)

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An investigation has been carried out on the stoichiometry, optical and electrical properties of chromium oxide thin films prepared under various deposition powers using RF magnetron sputtering technique. The elemental and chemical composition of the prepared films were characterised by energy dispersive x-ray (EDX) analysis, Raman spectroscopy and Fourier transform infrared spectroscopy (FTIR). The wettability and surface energies of the thin films were investigated with a goniometer. The four-point electrical probe method was used to determine the electrical resistivity of the films while the optical properties of the films were measured with a spectrophotometer. The coatingswere found to bemainly Cr2O3 phase based on the dominance of A1g and Eg symmetric modes in the Raman investigations and the Eu vibration mode in the FTIR measurements. The -RFFRT powers used during the deposition process were found to have played a vital role in the formation of Cr2O3 rich films. Itwas observed that higher deposition power facilitated both the dislodging ofmore chromium atoms from the target and dissociation of oxygen used during the deposition process. The wettability results show that the thin films are hydrophilic and interact well with water and this behaviour is linked to the contribution of the polar component to the total surface energy. Optical transmittance values exceeding 70% were obtained for the films prepared at a lower RF power. The resistivity values varied from 0.061 ω cm to 0.152 ω cm for the deposited chromium oxide films. The variation in the electrical resistivity and the optical transmittance of the films with RF power indicate that these film properties can be altered or tuned to suit specific applications e.g. as transparent conducting oxide (TCO) for optoelectronic devices and other similar applications. 