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Characterization of CuO/Si Thin Films Grown by the Magnetron Sputtering Technique

Two thin layers of copper oxide (CuO) were deposited on silicon substrates using the DC (direct current) magnetron sputtering technique, a physical vapor deposition method that enables precise control of film thickness and composition. The films were structurally, morphologically, and optically characterized using X-ray reflectometry (XRR), X-ray diffraction (XRD), atomic force microscopy (AFM), and UV-Vis spectroscopy. The XRR measurements allowed the determination of the thickness and surface roughness of both layers, revealing homogeneous and well-defined surfaces. The XRD patterns confirmed the formation of the monoclinic CuO phase, demonstrating good crystallinity and a preferential orientation on the silicon substrate. The AFM analysis showed uniform topography with low roughness values, indicating controlled deposition and surfaces suitable for optoelectronic applications. Finally, The UV-Vis spectroscopy revealed high absorbance in the visible range —characteristic of CuO— and enabled estimation of the optical bandgap of the layers, confirming their potential for photovoltaic devices and sensors. These results demonstrate that the combination of DC magnetron sputtering and advanced characterization techniques enables the production of high-quality CuO thin films on silicon.
Keywords: CuO thin films, Magnetron Sputtering, XRR, XRD, AFM, UV-Vis.

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