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Morphological Structural and Electrical Properties of DC Magnetron Sputtered Mo Thin Films for Solar Cell Application

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Molybdenum is one of the most important materials used as a back ohmic contact for $Cu(In,Ga)(Se,S)_2$ (CIGS) solar cells because it has good electrical properties as an inert and mechanically durable substrate during the absorber film growth. Sputter deposition is the common deposition process for Mo thin films. Molybdenum thin films were deposited on soda lime glass (SLG) substrates using direct-current planar magnetron sputtering technique. The outdiffusion of Na from the SLG through the Mo film to the CIGS based solar cell, also plays an important role in enhancing the device electrical properties and its performance. The structure, surface morphology and electrical characteristics of Mo thin films are generally dependent on deposition parameters such as DC power, pressure, distance between target and substrate, and deposition temperature. The aim of the present study is to show the resistivity of Mo layers, their crystallinity and morphologies, which are influenced by the substrate temperature. The thickness of Mo films is measured by Tencor-P1 profiler. The crystal structures are analyzed using X-ray diffraction (XRD: X'Pert MPD PRO / Philips). The resistivity of Mo thin films was measured by Hall effect measurement system (HMS-3000/0.55T). The surface morphology and grain shape of the films were examined by field emission scanning electron microscopy (FESEM: Hitachi S-4300). The chemical composition of the films was obtained by the energy dispersive X-ray spectroscopy (EDX). Finally the optimum substrate temperature as well as deposition conditions for Mo thin films will be developed.

Keywords: Mo, DC magnetron sputtering, Electrode