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Preparation and Characterization of Micron-Scale Molybdenum Metal Mesh Electrodes

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A promising candidate for a top cell in a tandem solar cell setup is a superstate, high bandgap, CIGS (Copper Indium Gallium Diselenide) solar cell. To realize a tandem cell, both, front and back contact of the top cell must be transparent. In this work a molybdenum metal mesh electrode with four pattern derivatives is presented, which are designed towards this implementation in a tandem cell setup. The electrode consists of two-micron wide fingers arranged in an industry typical H-grid pattern and in a hexagonal shaped pattern, with each of these patterns being comprised of a derivative with and without tapered busbars. The electrode's micro structure, crystal orientation, surface roughness, electrical properties and optical properties are investigated. The manufacturing process as well as a comparison of this works electrodes with various competing electrode types is also presented. All electrode derivatives show excellent transmittance of up to 97% within and beyond the visible spectrum while retaining acceptable sheet resistances of about 30 Ω/□.

Keywords: metal mesh; micro mesh; transparent conductive electrode; molybdenum; thin film; magnetron sputtering