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**Characterisation of Cu₂O/CuO thin films produced by plasma-assisted DC sputtering
for solar cell application**

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Abstract

For large-scale implementation of devices magnetron sputtering is a practical method of producing metal oxides, however sputtered copper oxides tend to form as a mixture of Cu₂O, Cu₄O₃, and CuO, with Cu₂O being particularly difficult to produce reliably in pure form. In this study, nanostructured thin films of Cu₂O, Cu₄O₃, and CuO were prepared using a novel reactive sputtering system, based on plasma-assisted DC magnetron sputtering with deposition and plasma assisted reaction zones spatially separated enabling separate control of film oxidation. X-ray diffraction, optical spectroscopy, and Raman Spectroscopy were used to characterise the physical and optical properties and it is shown that plasma-assisted DC sputtering is a suitable technique for reliable production of CuO and Cu₂O films in large areas at room temperature without the necessity of further processing. The results also indicate that solar cell performance may relate positively to the presence of crystalline Cu₄O₃ (200) and/or Cu₂O (111) over other crystalline forms of copper oxide or amorphous copper oxide thin films.

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