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**Plasma-Enhanced Pulsed Laser Deposition of metal-oxide thin films**[1] ERIK WAGENAARS, DAVID MEEHAN, SUDHA RAJENDIRAN, York Plasma Institute, Department of Physics, University of York, York, UK, ANDREW ROSSALL, School of Computing and Engineering, University of Huddersfield, Huddersfield, UK — Plasma-Enhanced Pulsed Laser Deposition (PE-PLD) is a novel technique for depositing metal-oxide thin films. It combines traditional PLD of metals with a low-temperature oxygen background plasma to create metal-oxide thin films. The chosen material for our proof-of-concept is copper oxide thin films. Copper oxide is a p-type semiconductor with a direct band gap of between 1.2eV and 2.13 eV and it is investigated for many (potential) applications, e.g. solar cell fabrication, supercapacitors and bio sensors. There are two (stable) forms of copper oxide, CuO and $Cu_2O$, both of which are of interest for applications as long as a single-phase material can be obtained. In our proof-of-concept study we show that using PE-PLD, we can deposit stoichiometric, high-quality, poly-crystalline films of both $Cu_2O$ and CuO, depending only on oxygen pressure. Deposition rates are 1-3 nm/min, comparable to traditional PLD. Importantly, PE-PLD does not need substrate heating or post-annealing to achieve high-quality films, allowing deposition on sensitive substrates. We demonstrate that PE-PLD can produce copper-oxide films on flexible polypropylene (PP) film substrates. Finally, we show that PE-PLD can also produce other poly-crystalline, stoichiometric metal-oxide thins films; Aluminium oxide and Zinc oxide.

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