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Pulsed Laser Deposition Growth of Delafossite ($CuFeO_2$) thin films and multilayers[1] TOYANATH JOSHI, Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506, PIERO FERRARI, Instituto de Física, Pontificia Universidad Católica de Chile, Santiago, Chile, PAVEL BORISOV, Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506, ALEJANDRO CABRERA, Instituto de Física, Pontificia Universidad Católica de Chile, Santiago, Chile, DAVID LEDERMAN, Department of Physics and Astronomy, West Virginia University, Morgantown, WV 26506 — Owing to its narrow band gap (<2 eV) and p-type conductivity delafossite $CuFeO_2$ is attractive for applications in the field of solar energy conversion. Obtaining pure phase $CuFeO_2$ thin films, however, is relatively difficult. It is necessary to maintain the lowest possible Cu valency (+1) in order to avoid forming the comparably stable spinel compound $CuFe_2O_4$. We present a systematic study of the pulsed laser deposition (PLD) growth conditions for epitaxial (00.1) oriented $CuFeO_2$ thin films on Al_2O_3 (00.1) substrates. The secondary impurity phase, $CuFe_2O_4$, was removed completely by optimizing the growth conditions. RHEED, XRD and TEM showed that the pure phase delafossite films are highly epitaxial to the substrate. The chemical purity was verified by Raman and XPS. The indirect bandgap of 1.15 eV was measured using infrared reflectivity, and is in agreement with the $CuFeO_2$ bulk value. Finally, we discuss the growth and structural characterization of delafossite multilayers, $CuFeO_2/CuGaO_2$.

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