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Temperature dependent structural disintegration of delafossite $CuFeO_2$ P. SHOJAN, ASHOK KUMAR, RAM KATIYAR, University of Puerto Rico — Single phase delafossite p-type $CuFeO_2$ (CFO) semiconductor was synthesized by modified solid state reaction technique. X-ray diffraction (XRD) and X-ray photo spectroscopy (XPS) studies suggest pure phase of CFO and Energy dispersive X-ray spectroscopy (EDX) also revealed that the atomic ratio Cu and Fe is 1:1. The XPS spectra showed two intense Cu 2p3/2 and 2p1/2 peaks at 932.5 eV and 952 eV and two Fe 2p3/2 and 2p1/2 peaks at 710 eV and 725 eV suggesting Cu and Fe ions are in +1 and +3 state with high spin S=5/2. The room temperature Raman spectra of CFO displayed two main strong active modes at 351 cm^{-1} and 692 cm^{-1} that matched with other delaffosite structure. Temperature dependent Raman spectra indicate that the lowest mode vanished or overdammped at $\sim$ 400 K where as higher modes shifted to lower frequency side with significantly decreased in intensity. We have also observed a low frequency ($E_2{}^{low}$) mode at 79 cm^{-1} using 532 nm (<5MHz line width) laser line. The line width and intensity of the lowest mode indicates temperature independent behavior. Raman Spectra were carried out from 80 K to 1300 K which revealed structural disintegration in CFO over 800 K in air. The structural degradation is counter confirmed by XPS, XRD, DTA measurements. Around 800 K in air, CFO disintegrates to form CuO and $CuFe_2O_4$.

Shojan P
University of Puerto Rico

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