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Structural and magnetic characterization of the complete delafossite solid solution $(CuAlO_2)_{1-x}(CuCrO_2)_x$ PHILLIP BARTON, RAM SESHADRI, Materials Department and Materials Research Laboratory, University of California, Santa Barbara, ANDREA KNÖLLER, Institut für Materialwissenschaft, Universität Stuttgart 70569, Germany, MATTHEW ROSSEINSKY, Department of Chemistry, University of Liverpool, England, UK — We have prepared the complete delafossite solid solution between diamagnetic $CuAlO_2$ and the t_{2g}^3 frustrated antiferromagnet $CuCrO_2$. The crystal structure and magnetism were studied with powder x-ray diffraction and magnetometry. The unit cell parameters follow the Végard law and μ_{eff} is equal to the Cr^{3+} spin-only $S = 3/2$ value. Θ_{CW} is negative and its magnitude increases with Cr substitution. For dilute Cr compositions, J_{BB} was estimated by mean-field theory to be 3.0 meV. Despite the sizable Θ_{CW}, long-range antiferromagnetic order does not develop until x is almost 1, and is preceeded by glassy behavior. For all samples, the 5 K isothermal magnetization is sub-Brillouin and does not saturate in fields up to 5 T. A scaled inverse susceptibility plot reveals that significant short-range antiferromagnetic interactions occur in $CuCrO_2$ above its Néel temperature. Additionally, the Al-substituted samples exhibit uncompensated short-range behavior and $x = 0.75$ shows glassy characteristics. It is suggested that reduction in magnetic frustration due to the presence of non-magnetic Al does not have as dominant an effect on magnetism as do chemical disorder and dilution of magnetic exchange.

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