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Band gap hierarchy of single crystal $CoFe_2O_4$ thin films from optical absorption spectroscopy BRIAN HOLINSWORTH, University of Tennessee - Knoxville, HUNTER SIMS, DIPANJAN MAZUMDAR, University of Alabama, QI SUN, University of Tennessee - Knoxville, MEHMET YURTISIGI, SANJOY SARKER, ARUN GUPTA, BILL BUTLER, University of Alabama, JANICE MUSFELDT, University of Tennessee - Knoxville — Thin film materials have a wide variety of applications and also serve as an useful bridge between bulk single crystals and the nanoscale. In this work, we report temperature-dependent optical absorption spectroscopy of single crystal $CoFe_2O_4$ thin-films along with complimentary electronic structure analysis. This magnetic insulator has one of the highest Curie temperature among complex oxides and potentially useful in areas such as spintronics. Similar to its Nickel analogue,[1] our work reveals $CoFe_2O_4$ to be an indirect band gap material (1.2 eV) with a direct gap much higher (2.8eV) at 300K. These gap values are robust down to 4.2K. Electronically, both chemical tuning and inversion fraction are found to be important factors in lowering of the band gap compared to $NiFe_2O_4$.

[1]Q.C. Sun, H. Sims, D.Mazumdar, J.X.Ma, B. Holinswoth, K.O'Neal, G.Kim, W.H.Butler, A.Gupta, and J.Musfeldt (accepted to Phys. Rev. B).

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