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Transport Measurements and Synchrotron-Based X-Ray Absorption Spectroscopy of Iron Silicon Germanide Grown by Molecular Beam Epitaxy[1] NADER ELMARHOUMI, RYAN COTTIER, Texas State Univ/Univ of North Texas, GREG MERCHAN, AMITAVA ROY, CAMD/LSU, CHRIS LOHN, HEIKE GEISLER, CARL VENTRICE JR., TERRY GOLDING — Some of the iron-based metal silicide and germanide phases have been predicted to be direct band gap semiconductors. Therefore, they show promise for use as optoelectronic materials. We have used synchrotron-based x-ray absorption spectroscopy to study the structure of iron silicon germanide films grown by molecular beam epitaxy. A series of $Fe(Si_{1-x}Ge_x)_2$ thin films (2000 – 8000Å) with a nominal Ge concentration of up to x = 0.04 have been grown. X-ray absorption near edge structure (XANES) and extended x-ray absorption fine structure (EXAFS) measurements have been performed on the films. The nearest neighbor co-ordination corresponding to the β-$FeSi_2$ phase of iron silicide provides the best fit with the EXAFS data. Temperature dependent ($20 < T < 350$ K) magneto transport measurements were done on the $Fe(Si_{1-x}Ge_x)_2$ thin films via Van Der Paw (VDP) Hall configuration using a 0.5-1T magnetic field and a current of 10-200 μA through indium ohmic contacts, the Hall coefficient was calculated. Results suggest semiconducting behavior of the films which is consistent with the EXAFS results.

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