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GMAG Dissertation Award Talk: Zero-moment Half-Metallic Ferrimagnetic Semiconductors[1]

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Low- and zero-moment half-metallic ferrimagnetic semiconductors [1,2] have been proposed for advanced applications, such as nonvolatile RAM memory and quantum computing. These inverse-Heusler materials could be used to generate spin-polarized electron or hole currents without the associated harmful fringing magnetic fields. Such materials are expected to exhibit low to zero magnetic moment at room temperature, which makes them well-positioned for future spin-based devices. However, these compounds have been shown to suffer from disorder [3]. This work focuses on the synthesis of these compounds and the investigation of their structural, magnetic, and transport properties. Cr_2CoGa and Mn_3Al thin films were synthesized by molecular beam epitaxy, and V_3Al and Cr_2CoAl were synthesized via arc-melting. Rietveld analysis was used to determine the degree of ordering in the sublattices as a function of annealing. The atomic moments were measured by X-ray magnetic circular and linear dichroism confirmed antiferromagnetic alignment of sublattices and the desired near-zero moment in several compounds.

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