



High-Field Magnetotransport in CrVTiAl

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Introduction

CrVTiAl is predicted to be a zero-moment spin-filter material at room temperature. With magnetic exchange splitting the band gaps are different for each spin channel, CrVTiAl should be an effective material for producing spin-polarized currents at room temperature and without harmful fringing fields.

Experimental

Films of CrVTiAl were grown on SiO₂/Si via magnetron sputtering and annealed at several temperatures. The longitudinal and transverse magnetoresistance (MR) were measured at temperatures from 1.5 to 50 K in a 35 Tesla, 32 mm Bore Magnet at the DC Fields facility.

Results and Discussion

Longitudinal MR measurements show that the CrVTiAl films exhibit two parallel conduction channels exhibiting positive quadratic MR. The resulting MR behavior with curve fits is shown in Fig. 1, giving mobilities of 40 and 800 cm²/Vs for the two channels. The Hall resistivity shows overall linear behavior with an anomalous Hall component which saturates near 15 T, shown in Fig. 1. In addition, at 50 K, the longitudinal MR is suppressed below 15 T. For the annealed samples this suppression begins to be seen at lower temperatures.

Conclusions

These results combined with previous $\rho(T)$ and $M(T)$ measurements demonstrate that CrVTiAl is a compensated ferrimagnetic spin-gapless semiconductor. A manuscript incorporating these results with DFT calculations is currently under preparation for Phys. Rev. B.

Acknowledgements

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References

[1] G. M. Stephen, et al., Appl. Phys. Lett. **109**, 242401 (2016).

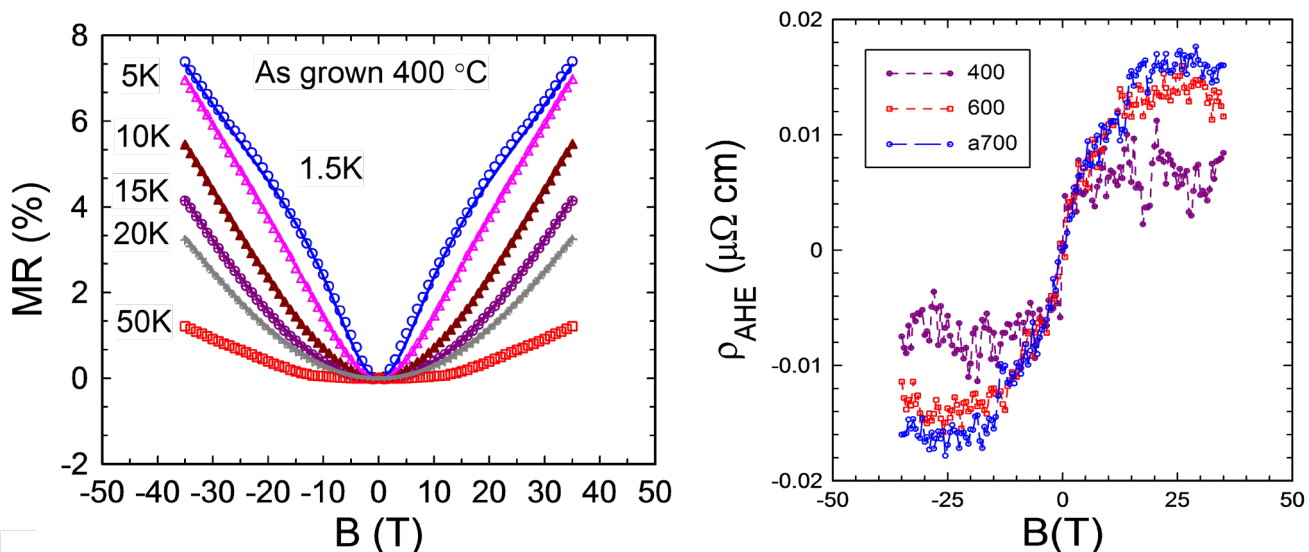


Figure 1: (left) MR of as-grown CrVTiAl film with fits to a 2-carrier MR model. (right) Anomalous Hall resistivity for CrVTiAl as-grown and annealed films.