

## Local magnetism of YbCrSb<sub>3</sub>, an anomalous member of the RECrSb<sub>3</sub> series

K.H. Chow<sup>1</sup>, W.A. MacFarlane<sup>2</sup>, Z. Salman<sup>3,4</sup>, I. Fan<sup>1</sup>, S.J. Crerar<sup>5</sup>, A. Mar<sup>5</sup>, M. Egilmez<sup>1</sup>, J. Jung<sup>1</sup>, B. Hitti<sup>6</sup>, D.J. Arseneau<sup>6</sup>

<sup>1</sup>*Department of Physics, University of Alberta, Edmonton, AB, Canada T6G 2G7*

<sup>2</sup>*Department of Chemistry, University of British Columbia, Vancouver, BC, Canada V6T 1Z1*

<sup>3</sup>*Clarendon Laboratory, Department of Physics, Oxford University, Parks Road, Oxford OX1 3PU, UK*

<sup>4</sup>*ISIS Facility, Rutherford Appleton Laboratory, Chilton, Oxfordshire, OX11 0QX, UK*

<sup>5</sup>*Department of Chemistry, University of Alberta, Edmonton, Canada T6G 2G2*

<sup>6</sup>*TRIUMF, 4004 Wesbrook Mall, Vancouver, BC, Canada V6T 2A3*

In recent years, the family of quasi-two-dimensional intermetallic compounds with the chemical formula RECrSb<sub>3</sub> (RE=La,Ce,Pr,Nd,Sm,Gd,Tb,Dy,Yb) have been the subject of a number of studies aimed at understanding their magnetic and transport properties. The compound YbCrSb<sub>3</sub> is a relatively new member of the RECrSb<sub>3</sub> series. A detailed report of its structural, magnetic and electrical properties was first presented in Ref. [1]. YbCrSb<sub>3</sub> is isostructural to the other RECrSb<sub>3</sub> compounds in the series. However, it appears to show “anomalous” properties. These include (i) a cell volume that is considerably larger than that expected from an extrapolation of increasing atomic number of the RE atom due to lanthanide contraction, and (ii) whereas the Curie temperature  $T_c$  in the other RECrSb<sub>3</sub> compounds decrease monotonically with increasing size of the RE ion, YbCrSb<sub>3</sub> shows a dramatic increase in the  $T_c$  that is in fact the highest of all the RECrSb<sub>3</sub> materials studied to date. The suggestion is that these differences are a consequence of the Yb being in a divalent charge state while the other RE ions in the series are trivalent.

In this paper, we report  $\mu$ SR measurements of the local magnetism in polycrystalline YbCrSb<sub>3</sub>. The experiments in near zero-field show coherent muon spin precession (at  $\approx 80$  MHz at low temperatures), establishing at the local level that a significant fraction of the sample is in a well-ordered, 2D-like, long range magnetic state below  $\approx 240$ K. In addition, there is evidence of additional ordered magnetism below  $\approx 50$  K. These studies are compared with the bulk measurements [1], as well as previous  $\mu$ SR measurements on other selected RECrSb<sub>3</sub> compounds, such as RE=La [2].

[1] S.J. Crerar, L. Deakin, and A. Mar, Chem. Mater. **17**, 2780 (2005).

[2] W.A. MacFarlane, K.H. Chow, Z. Salman, A.V. Tkachuk, and A. Mar, Physica B **374-375**, 71 (2006).