Spin and Momentum Densities in Heusler Alloys

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The spin polarisation of ferromagnets at room temperature is a key property for any application wishing to exploit spin-dependent transport [1]. Yet it is not a simple problem to measure that spin polarisation, particularly in the bulk [2].

The electron momentum distribution contains information about the ground-state wave functions of the electrons in a material, and about the occupation of those states. The techniques of high resolution Compton scattering and magnetic Compton scattering make it possible to probe this momentum distribution, and to look at the spin density in momentum space, and indeed the Fermi surface of bulk materials [3].

A study of the bulk electronic structure of a Heusler alloy, Co_2MnSi, which is reputed to be half-metallic [4] (that is to say that it only has a Fermi surface in the majority spin channel, and thus has carriers which are 100% spin-polarised) will be presented. The experimental measurements of the momentum density and Fermi surface, as well as the spin-density were performed at SPring-8 in Japan, and theoretical calculations were made with the ELK full potential code [5,6].

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[4] Jourdan *et al.*, Nat. Comm. **5** 3974 (2014)
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[6] Ernsting *et al.*, J. Phys.: Condens. Matter **26,** 495501 (2014)