



Monoclinic symmetry of the hcp phase of Cobalt

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The hexagonal close packed phase of cobalt (hcp-Co) is associated with numerous stacking faults while the face centered cubic phase of cobalt (fcc-Co) has considerably less stacking faults, as shown e.g. in [1]. Two domains of hcp-Co stacked one above the other with a stacking fault in between are usually delimited by a small interface region of a few fcc-Co layers as shown e.g. in [2,3]. The crystal structures of hcp-Co and fcc-Co should be considered together because the crystallites of these two phases are often clustered together in the same grains of cobalt. The gradual ferromagnetic spin reorientation in hcp-Co between 230 °C and 330 °C reported in [3] suggests that this phase could not have a hexagonal symmetry. This hypothesis is verified positively by synchrotron radiation and neutron powder diffraction [4]. The crystal structure of the hcp phase of cobalt is described by the monoclinic symmetry with the magnetic space group $C2'/m'$. In this monoclinic crystal structure the former hexagonal [001] axis is no longer perpendicular to the hexagonal layers. The monoclinic structure is an approximate description of the multitude of stacking faulted hcp-Co domains coexisting with fcc-Co domains.

- [1] O. S. Edwards and H. Lipson, Proc. R. Soc. Lond. Ser. A-Math. Phys. Sci. 180, 268 (1942).
- [2] O. Blaschko, G. Krexner, J. Pleschiutchnig, G. Ernst, C. Hitzenberger, H. P. Karthaler, and A. Korner, Phys. Rev. Lett. 60, 2800 (1988).
- [3] E. Bertaut, A. Delapalme, and R. Pauthenet, Solid State Commun. 1, 81 (1963).
- [4] P. Kozłowski, P. Fabrykiewicz, I. Sosnowska, F. Fauth, A. Senyshyn, E. Suard, D. Oleszak and R. Przeniosło - in preparation.

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