Pressure evolution of magnetic properties of Fe doped $NdCo_{12-x}Fe_xB_6$

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Intermetallic compounds based on rare-earth (R) and 3 d transition metal (T) presents not only application potential in everyday life but are also challenging our fundamental understanding of magnetism. Earlier reports on the $RCo_{12}B_6$ series show that these compounds order ferromagnetically for light rare-earth elements and ferrimagnetically for heavy compounds both exhibiting remarkably small Co magnetic moment. They crystallize in the rhombohedral structure of the $SrNi_{12}B_6$ type (space group) [1, 2, 3]

In the present work we study the magnetic behaviour of Fe substituted $NdCo_{12-x}Fe_xB_6$ (with x = 0.5 and 1.0) compounds under applied hydrostatic pressure up to 9 kbar. These $NdCo_{12-x}Fe_xB_6$ compounds order below 200K and attracted our attention due to the presence of spin reorientation transition near 50K [4]. This has been interpreted as resulting from the competition between the Nd and Co sublattices anisotropy in pure $NdCo_{12}B_6$. The pressure dependence of the temperature of the magnetic ordering as well as spin-reorientation temperature was observed. The Curie temperature shows significant decrease with increasing pressure of 0.56 K/kbar which is higher than values reported for related $YCo_{12}B_6$ and $LaCo_{12}B_6$ compounds [5]. The spin-reorientation transition was observed to decrease with respect to pressure although it was less sensitive. Such behaviour can be understood as the Curie temperature is mainly determined by the transition metal subblatice where the spin-reorientation transition results from the interaction with localised Nd 4f-electrons. The determined pressure dependence of Curie temperature is presented on figure 1. The effect of pressure on the magnetic properties is compared to that of Fe for Co substitution reported previously [4] and interpreted in the light of the preferential substitution on one crystal position [7].

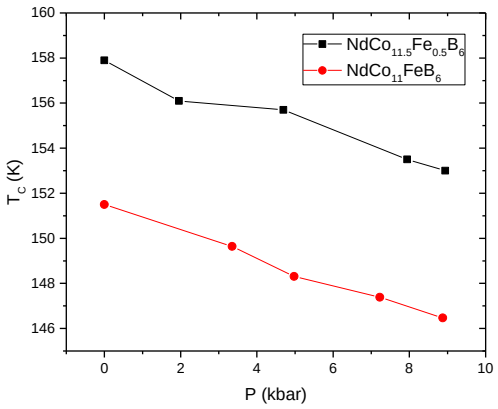

Figure 1. The Curie temperature versus pressure

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