Magnetisation and electron spin resonance of the colossal magnetoresistive $La_{0.67}Ca_{0.33}Mn_{1-x}$ Fe_xO_3

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We report magnetisation and electron spin resonance (ESR) measurements on colossal magnetoresistive manganites $La_{0.67}Ca_{0.33}Mn_{1-x}$ Fe_xO_3 with x = 0, 0.01, 0.03, 0.06, 0.10 and 0.15 in the vicinity of the magnetic (T_C) and metal-insulator (T_{MI}) transition temperatures, (see Fig. 1). Above T_C the resonance lines with g ≅ 2 are caused by the ferromagnetic metallic clusters, exhibiting the double exchange interaction between Mn^{3+}-Mn^{4+} ions [1]. The lines were observed with cooling far below both T_C and T_{MI} and were fitted by Dysonian line shape (see Fig. 2). Temperature dependences of the linewidths (ΔB) exhibited a minimum value at $T^* \cong 1.25\ T_C$ followed by an increase of the width with further cooling toward T_C. The anomalous behaviour of ΔH_{pp} below T^* is due to an appearance of a ferromagnetic metallic phase within the paramagnetic matrix. The role of phase segregation in which the compounds is phase-separated into a mixture of ferromagnetic and paramagnetic regions is discussed.

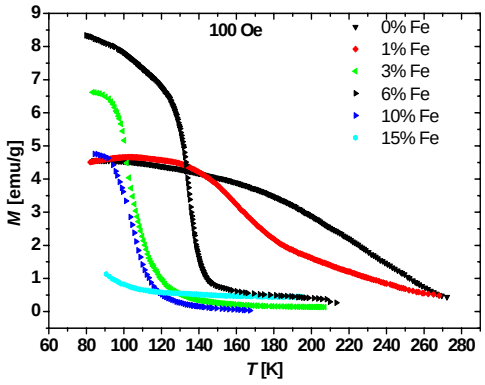

Fig. 1. Magnetisation *vs* temperature

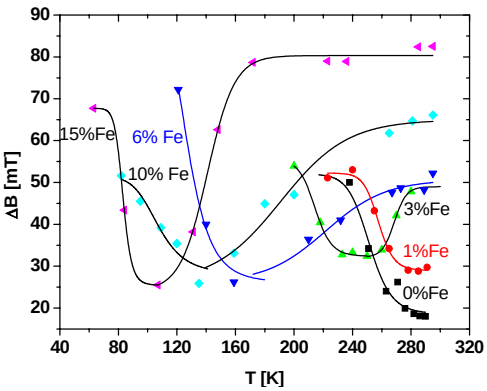

Fig. 2. Resonance line width *vs* temperature

[1] T. Zając *et al.*, J. Magn. Magn. Mater. **272-276** (2004) 120.

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