Local magnetic properties of $Mn_5Ge_3C_x$: ^{55}Mn NMR study

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Hexagonal Mn_5Ge_3 compound, with Mn in two nonequivalent positions: 4d (Mn_I) and 6g (Mn_{II}), is a prospective spintronic material due to high spin polarization and high Curie temperature (up to 450 K in case of samples doped with carbon). To investigate the magnetic properties of this system, an extensive ^{55}Mn NMR study was carried out on a series of epitaxial films of $Mn_5Ge_3C_x$ for $0<x<0.85$. The NMR spectrum recorded from the pristine Mn_5Ge_3 thin film reveals NMR lines at 210 MHz and 430 MHz, readily attributed to Mn_I and Mn_{II} sites, respectively. Upon the inclusion of carbon, Mn_{II} sites are first to be affected, with a new NMR line quickly developing around 355 MHz, indicating a number of Mn_{II} atoms with altered magnetic moments. This new value of Mn magnetic moment results from the strong bonding the carbon atoms make with Mn_{II} as the nearest neighbors. The effect of carbon is much smaller on Mn_I sites where it plays the role of a more distant neighbor, and is visible only after reaching a much higher C concentration, close to $x=0.5$.