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Giant magnetic anisotropy in $Li_{3-x}Fe_xN$ permanent magnets[1]
ANTON JESCHE, SRINIVASA THIMMAIAH, SERGEY BUD'KO, PAUL CANFIELD, The Ames Laboratory, Iowa State University, Ames, USA — Single crystals of $Li_2(Li_{1-x}Fe_x)N$ were successfully grown out of Li-flux. Fe-concentrations and lattice parameters were determined by means of single crystal and powder diffraction which also confirmed the substitution of Fe on only one of the Li sites resulting in $Li_{1-x}Fe_x$ layers separated by Li_2N layers. Magnetization measurements revealed a ferromagnetically ordered ground state with Curie temperatures of $\sim 60\,K$ for Fe concentrations of $x \approx 20\%$. Large saturation moments of up to $5\,\mu_B$ per Fe atom were found along the hexagonal crystallographic c-axis. These values exceed the spin-only contribution of Fe and are also reflected in correspondingly large effective moments at room temperature. The anisotropy field at $T = 2\,K$, defined as intersection of the magnetization for $M \parallel c$ and $M \perp c$, can be estimated to lie well beyond 100 Tesla. Electrical resistivity measurements show insulating behavior and raise questions about the nature of the underlying magnetic exchange mechanism.

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