Magnetoresistance and Hall Effect in Single-Crystals $Mn_{1-x}Fe_xSi$ and $Mn_{1-x}Co_xSi$

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Complex spin textures with non-trivial topology may generate anomalous contributions in the Hall conductivity, the so-called topological Hall effect, that provide direct evidence of non-vanishing winding numbers. We report a comprehensive study of the evolution of the spin structures and spin textures in $Mn_{1-x}Fe_xSi$ and $Mn_{1-x}Co_xSi$ by means of the magnetoresistance and the Hall effect. Our study identifies the A-phase, located just below the helimagnetic transition, as a sykrmion lattice for a wide range of x. Combining the bulk properties and small angle neutron scattering with our Hall effect data additionally suggests the formation of non-trivial spin textures in parameter regimes outside the A phase when approaching quantum criticality under Fe- and Co-doping. Similarities and differences with pure MnSi and the doped semiconductor $Fe_{1-x}Co_xSi$ will be discussed.