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Magnons in the collinear antiferromagnetic phase of Mn5Si3

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The antiferromagnetic compound Mn5Si3 is an interesting material for applications since it is hosting rich physics, such as the inverse magnetocaloric effect [1] and a large anomalous Hall effect [2]. Despite the intense research activity over the past decades [1-5], many open questions remain regarding the minimal magnetic model Hamiltonian, the role of the spin fluctuations in the magnetically ordered phases and which Mn site is responsible for them. We addressed some of these problems by combining polarized and unpolarized inelastic neutron scattering measurements and density functional theory calculations. We investigated the electronic and magnetic properties of the system and determined the magnetic exchange interactions and the biaxial magnetocrystalline anisotropy in the high temperature collinear antiferromagnetic phase of Mn5Si3. This provided the parameters for a Heisenberg model, from which we computed the spin-wave energies as a function of the external magnetic field applied perpendicular to the preferred axis. Our experimental data and theoretical results are in good agreement with each other.
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