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Ferromagnetism in magnetic 4f-systems

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Abstract content
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In magnetic 4f-systems electronic and magnetic properties are carried by two different electron groups. These materials are ferromagnetic semiconductors and insulators and have become important recently due to their applications in spintronics. For their realistic theoretical description the sf-model is used that contains the electron-magnon interaction in the form of an intraatomic exchange coupling between the itinerant conduction and the localized 4f-electrons. The sf-model is solved exactly in the zero bandwidth limit; it turns out that finite band occupations n reduce the saturation magnetization so that $m(T=0, n \neq 0) < S$. Furthermore, the Curie temperature T_C depends on the band occupation n which is experimentally modeled by doping with suitable impurities. The theoretical calculations are shown to reasonably agree with experimental results.

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