Magnetic properties of the chain antiferromagnet RbFeSe₂

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Single crystals of the ternary iron selenide RbFeSe₂ (with linear chains of FeSe₄ tetrahedra) have been investigated by means of X-ray diffraction, Mössbauer, magnetic susceptibility and specific heat measurements. Our Mössbauer experiments performed from room temperature (RT) down to 4.2 K have shown that the compound undergoes a magnetic phase transition near 248 K. Mössbauer parameters determined in the entire temperature range indicate that iron in RbFeSe₂ is in ferric (trivalent) state having strong covalent bonding to selenium ligands. The measured hyperfine field of 216 kOe at 4.2 K is quite reduced compared with that in high-spin ferric compounds. The SQUID susceptibility and specific heat measurements confirm that RbFeSe₂ exhibits 3D collinear antiferromagnetic order below $T_N = 248$ K with magnetic moments oriented perpendicular to the chain direction. The strict linear increase of the susceptibility to high temperatures strongly suggests a one-dimensional metallic character of RbFeSe₂ along the chains.

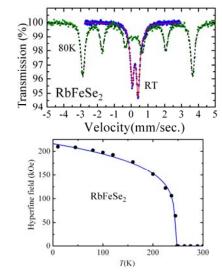


Fig. 1. Mössbauer spectra at RT and 80 K (top), hyperfine field *vs* temperature (bottom)

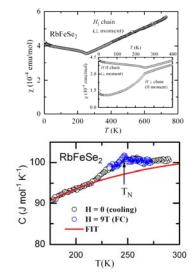


Fig. 2. Magnetic susceptibility *vs* temperature (top), specific heat *vs* temperature (bottom)