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On the phase diagrams of the helimagnets MnSi and Cu₂OSeO₃
SERGEI M. STISHOV, ALLA E. PETROVA, V.A. SIDOROV, Institute for High Pressure Physics of Russian Academy of Sciences — A series of resistivity measurements on a MnSi single crystal was performed at high pressures, created by a piston-cylinder device with a liquid pressure medium. The form of the resistivity curve at ambient pressure clearly indicates a first order nature of the magnetic phase transition in MnSi. Application of high pressure rapidly degrades the first order features of the phase transition. The temperature derivative of resistivity demonstrates two notable features of the phase transition that disappear on increasing pressure: a sharp peak marking the first order phase transition and a shallow maximum situated slightly above the critical temperature and pointing to prominent helical fluctuations. The current experimental data rule out any strong first order phase transition in MnSi at high pressures and low temperatures, which would prevent development of a quantum critical region. On the contrary, there should exist true quantum critical phenomena in MnSi at high pressures because a weak first order transition, if it survives at high pressures to the lowest temperatures, should not suppress the entire quantum critical region. Recently a dielectric compound Cu₂OSeO₃ possessing a cubic non-centro symmetric P2₁3 crystal structure, like MnSi was found to have a magnetic structure and T-H magnetic diagram similar to those of MnSi [1]. We have studied the magnetic transition in this material by means of magnetic ac-susceptibility and ac-calorimetry at nearly hydrostatic pressure up to 6 GPa. The data obtained are analyzed in hope to understand the nature of the chiral fluctuation region adjacent to the helical phase transitions.

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