Magneto-transport properties of $BaNiS_2$ and $BaCoS_2$ under high pressure up to 10 GPa

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During the 1990s, the quasi-2D $BaCo_{1-x}Ni_xS_2$ system (x = 0 to 1) has been topic of numerous studies due to its similarity with high-T_C superconducting materials. Its structure consists of electronically active Co(Ni)S sheets sandwiched between BaS layers. The relation between magnetism and transport properties in $BaCo_{1-x}Ni_xS_2$ is quite complex and not yet understood. As an illustration, the mother compound (x = 0) exhibits a paramagnetic to antiferromagnetic transition at T_N ~ 300 K, but without any transition in the transport properties [1]. On the other hand, when doped with Ni, the system undergoes a metal–insulator transition (MIT) at x ~ 0.22 [1]. A systematic study on the two end members of the series ($BaNiS_2$ and $BaCoS_2$) should help to unveil the mechanism of the MIT.

The control of the bandwidth and band-filling are two traditional ways to understand and manipulate the MIT. Experimentally, the bandwidth control can be achieved by applying a high pressure that may provide a tool to adjust the magnetic properties simultaneously.

In that respect, we have carried out magneto-transport measurements under high pressure up to 10 GPa on high quality single-crystals of $BaNiS_2$ and $BaCoS_2$**.** The resistance is measured down to a temperature of 2 K and under magnetic fields of up to 9 T. Only $BaCoS_2$ shows an MIT. $BaNiS_2$ keeps a metallic behavior, except at the lowest temperature where a weak localization is found. The results presented are interpreted with a Debye model.

[1] L. S. Martinson, J. W. Schweitzer, and N. C. Baenziger, *Phys. Rev. Lett.* **71**, 125 (1993).