Formation of the layered conductive magnet CrCl₂(pyrazine)₂ through redox-active coordination chemistry - DTU Orbit (08/08/2019)

**Formation of the layered conductive magnet CrCl₂(pyrazine)₂ through redox-active coordination chemistry**

The unique properties of graphene, transition-metal dichalcogenides and other two-dimensional (2D) materials have boosted interest in layered coordination solids. In particular, 2D materials that behave as both conductors and magnets could find applications in quantum magnetoelectronics and spintronics. Here, we report the synthesis of CrCl₂(pyrazine)₂, an air-stable layered solid, by reaction of CrCl₂ with pyrazine (pyz). This compound displays a ferrimagnetic order below ~55 K, reflecting the presence of strong magnetic interactions. Electrical conductivity measurements demonstrate that CrCl₂(pyrazine)₂ reaches a conductivity of 32 mS cm⁻¹ at room temperature, which operates through a 2D hopping-based transport mechanism. These properties are induced by the redox-activity of the pyrazine ligand, which leads to a smearing of the Cr 3d and pyrazine π states. We suggest that the combination of redox-active ligands and reducing paramagnetic metal ions represents a general approach towards tuneable 2D materials that consist of charge-neutral layers and exhibit both long-range magnetic order and high electronic conductivity.

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