

Structural, magnetic and electronic properties of new 2D compounds with VS₂ layers.

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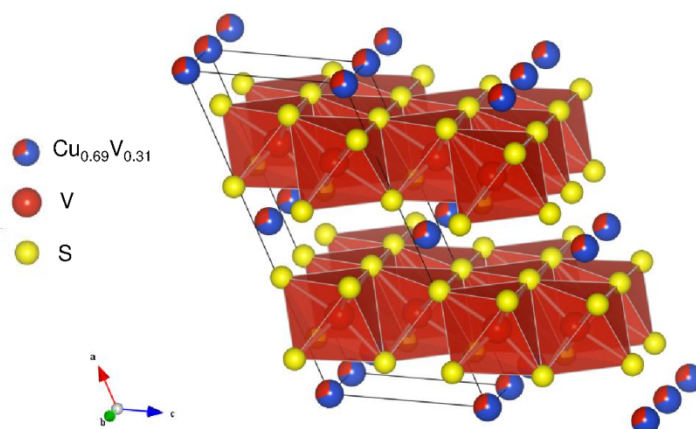
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2D transition metal dichalcogenides are regarded as an interesting playground to study the stability and the properties of the charge density wave (CDW) in a hexagonal lattice. One example is the metastable compound 1T-VS₂, with the CdI₂-type structure, in which an incommensurate CDW develops when prepared from the Li-extraction of LiVS₂. As a consequence, the system is characterized by a “bad-metallic” electrical resistivity [1]. We have recently stabilized 1T-VS₂ with a high pressure (HP) technique and the latter compound exhibits rather a semi-metallic resistivity. This is in accordance with electronic diffraction experiments evidencing a suppression of the CDW and suggests different electronic states of vanadium in the HP phase and the Li-extracted phase. The electronic state is then strongly connected to pressure effects.

Using HP synthesis, other VS₂-based compounds with various physical properties, such as Cu_{1-x}V_{2+x}S₄ [2] and Sr₃V₅S₁₁ can also be stabilized. In the first compound, VS₂ layers are connected together through Cu-chains which impose a strong distortion to the hexagonal lattice (see the figure). The resistivity is metallic-like and suggests an intermediate valence state of the vanadium cation. The second compound is characterized by V⁴⁺ electronic states in the VS₂ layers, which is in accordance with the semiconducting-like resistivity.



[1] : M. Mulazzi *et al.*, *Phys. Rev. B* **82**, 075130 (2010).

[2] : Y. Klein *et al.*, *J. Solid State Chem.* **184**, 2333 (2011).