Scientists develop colossal 3D electrical anisotropy of MoAlB single crystal
17 December 2021, by Zhang Nannan

According to experimental and theoretical studies, the 3D structural anisotropy of MoAlB was confirmed by single crystal X-ray diffraction and transmission electron microscopy. 3D anisotropic electronic structure and chemical bond of MoAlB were confirmed by theoretical calculation.

Additionally, 3D anisotropic phonon vibration of MoAlB single crystal were observed in the measurement of Raman spectroscopy. Therefore, the origin of this huge 3D anisotropic electrical conductivity was mainly attributed to its 3D anisotropy of crystal and electronic structure.

This study opens a new way to find 3D anisotropic functional material in layered material systems with 3D anisotropy of crystal structure and chemical bond.

Three-dimensional (3D) anisotropic functional properties of a single material (such as magnetic, electrical, thermal and optical properties, etc.) are not only conducive to the multi-use of materials, but also help to enrich the regulatory dimension of functional materials.

Researchers from the Hefei Institutes of Physical Science (HFIPS) of the Chinese Academy of Sciences (CAS) have successfully grown 3D layered MAB-phase MoAlB single crystal and discovered colossal 3D electrical anisotropy. Related results were published in Small.

They used aluminum as a cosolvent and prepared high-quality and large-sized MoAlB single crystals. In this process, they found, unexpectedly, the huge 3D conductivity anisotropy in MoAlB single crystal, which was larger than previously reported.
Fig. 3. 3D anisotropic electronic structure and electrical transport of MoAlB single crystal. Credit: Huang Yanan


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