Single Crystal Synthesis, Structure, and Magnetic Properties of CrAl3Bi2O9, the First Cr-Al-Bi-O Compound

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In this study, the first chromium aluminum bismuthate is synthesized with a formula of CrAl3Bi2O9 as an orthorhombic single crystal with interesting magnetic properties and potential thermoelectric capabilities. Our magnetometry data reveal the innate paramagnetism of the crystal despite the strange occurrence where there are deviations from the Brillouin function on a plot, hinting at antiferromagnetism at different temperatures. Predictions concerning thermoelectric properties can be made due to the quasi one-dimensional structure and spaces within octahedra and tetrahedra that allow for large vibrational amplitudes. The material could be found useful in automotive exhaust systems as well as small scale systems requiring a size reduction in thermal, electrical, or magnetic components.

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