

Abstract Submitted  
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**Is Orthorhombic Iron Tetraboride Superhard?** BO XU, QIANQIAN WANG, JULONG HE, YONGJUN HE, Yanshan University — Millimeter-sized  $\text{FeB}_4$  bulks were synthesized under high pressure of 15 GPa and 1600 °C. Multiple analysis methodologies including XRD, SEM, TEM, and Raman spectroscopy verified this new phase with an oP10 crystal structure. A relatively low hardness value of 15.4 GPa, which is consistent with both macroscopic and microscopic hardness models, excludes  $\text{FeB}_4$  as a superhard material. Resistance and magnetization measurements do not indicate superconductivity in  $\text{FeB}_4$  for temperature as low as 2.5 K. Previously reported superconductivity in  $\text{FeB}_4$  needs a further investigation, especially for structural imperfections, unidentified phases, and/or contaminations.

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