

Abstract Submitted  
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**Superhard Tantalum Borides Via Microwave Plasma Chemical Vapor Deposition .<sup>1</sup>** KALLOL CHAKRABARTY, University of Alabama at Birmingham, AADITYA RAU, arau5@jhu.edu, PAUL A. BAKER, SHANE A. CATLEDGE, University of Alabama at Birmingham — Tantalum borides have become a subject of interest due to their excellent properties: high hardness, wear resistance, chemical inertness. Different techniques have been used to synthesize tantalum borides, including high temperature/pressure compression in diamond anvil cells and traditional powder or pack boriding and chemical vapor deposition. These methods have some limitation such as small volumes of deposition and contamination issue. In this research work, we have used novel Microwave Plasma Chemical Vapor Deposition method to synthesize tantalum boride.  $H_2$  and  $B_2H_6$  was used as a feed gas and boron was diffused into tantalum substrate. The sample was analyzed using X Ray Diffraction and Nanoindentation. The Structure of the produced sample was mixture of TaB and TaB<sub>2</sub> Phase. XRD patterns show a clear increase in the relative intensity of the TaB<sub>2</sub> phase with temperature, accompanied by an increase in hardness measured via nanoindentation. The hardness value of the produced sample was in superhard regime and mean hardness was 4010 GPa.

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