TUNGSTEN DIBORIDE FOR HIGH ENERGY NUCLEAR APPLICATIONS

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Tungsten diboride is a highly effective shielding material for energetic neutrons, making it an attractive candidate for many nuclear reactor applications including the spherical tokamak fusion reactor. However, there is little processing or property data available for the compound. We report the densification kinetics of commercial tungsten diboride powders via hot pressing in inert gas. The process is optimised in terms of time, temperature, applied stress, and powder size. Secondly, we report the structure of the as-sintered pellets using X-ray diffraction and electron microscopy. In particular, we are developing high-resolution energy dispersive X-ray technique to resolve the boron chemistry, which is challenging in this compound due to the large mass difference between boron and tungsten. Finally, the thermal and mechanical properties of these materials are reported. Of particular interest to the application of the spherical tokamak fusion reactor is the mechanical performance of the material at high temperature. Bend test data carried out in a vacuum furnace with graphite fixtures is reported up to 2000°C.