| Research Paper



# ELECTROCHEMICAL POLARIZATION STUDIES ON SPARK PLASMA SINTERED SS316-$B_4C$ COMPOSITE

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## Abstract

The corrosion behavior of 316 stainless steel with 10 wt.% $B_4C$ composites has been investigated using electrochemical measurements and electron backscattered diffraction (EBSD) and scanning electron microscopy (SEM) analyzes are performed. Spark plasma sintering (SPS) is used to achieve various heat treatments, which are performed at the temperatures of 800°C, 900°C, and 1000°C. It significantly affects the materials' ability to resist corrosion. The increase in grain size improves corrosion resistance, except at 900°C when recrystallization is imperfect. However, grain homogeneity should be taken into consideration. The corrosion behavior of the composites is assessed using Tafel plots. The corrosion rate of the sample at 900°C (0.2945 mm/yr) is significantly lower than the rates of the samples at 800°C and 1000°C, respectively, as per the corrosion process of composites of 3.5 wt.% NaCl solution. The $B_4C$ contents have a significant impact on the

hardness, corrosion resistance, and thermal stability of composite powder. It is primarily utilized in nuclear applications as a neutron radiation absorbent. The research has revealed that the sample at 900°C has fewer grain boundaries and the finest passivation film quality and superior corrosion resistance are found in intermediate grain size.

**Keywords:** Corrosion ▪ EBSD ▪ spark plasma sintering ▪ 316 stainless steel ▪ boron carbide