

Investigations of high-temperature mechanical behaviour of a niobium-alumina refractory composite

G. Günay^a, T. Zienert^b, C.G. Aneziris^b, H. Biermann^a, A. Weidner^a

^a Institute of Materials Engineering, TU Bergakademie Freiberg, Gustav-Zeuner-Str. 5, 09599 Freiberg, Germany

^b Institute of Ceramics, Refractories and Composite Materials, Agricolastr. 17, 09599 Freiberg, Germany

^a goekhan.guenay@iwt.tu-freiberg.de

Refractory metal-ceramic composites have a low shrinkage behaviour and good thermal resistance. Recently, fine- and coarse-grained niobium-alumina composites were developed using different manufacturing routes such as slip-casting and extrusion. In the present study, the high-temperature mechanical properties of these refractory niobium-alumina composites were studied. For this purpose, compression tests were conducted at four different temperatures; RT, 1100°C, 1300°C and 1500°C and at different strain rates. In addition, creep behaviour was studied under compression. The results show that the porosity affected the mechanical properties significantly. As-cast coarse-grained composites with lower open porosity showed higher strength compared to fine-grained composites. The extruded composites have the lowest strength with the highest porosity. In addition, an increase in temperature resulted in a decrease in strength but an increase in plasticity for all tested materials. The influence of strain rate on strength was as expected: an increase in strain rate resulted in a moderate increase in strength. The microstructure of deformed specimens was studied using scanning electron microscopy.

Keywords: refractory composites, high-temperature, mechanical properties, porosity