ICSMA19 Metz, France, June 26 - July 1, 2022
International Conference on Strength of Materials

Mechanical behavior of carbon-bonded alumina foam materials based on a lactose-tannin binder system at high temperatures

Xian Wu[a], Benjamin Bock-Seefeld[b], Anja Weidner[a], Christos G. Aneziris[b], Horst Biermann[a]

[a]*Technische Universität Bergakademie Freiberg, Institute of Materials Engineering, Gustav-Zeuner-Straße 5, 09599 Freiberg, Germany*

[b]*Technische Universität Bergakademie Freiberg, Institute of Ceramics, Refractories and Composite Materials, Agricolastraße 17, 09599 Freiberg, Germany*

[a]*xian.wu@iwt.tu-freiberg.de*

Ceramic foam filters (CFFs) made of carbon-bonded alumina (Al_2O_3-C) are used to produce high-quality molten steels containing as few as possible non-metallic inclusions (NMIs) which may deteriorate the mechanical properties of the metal after solidification. For manufacturing of these filters environmentally more friendly, a lactose-tannin binder system has been recently introduced. Investigations on the thermomechanical behavior of Al_2O_3-C foam filters based on the new binder system are necessary for a deeper understanding of the filter material at high temperatures.

Using a high-temperature testing machine with inductive heating equipment, compression and creep tests were performed at temperatures between 700 and 1400 °C under argon atmosphere for cylindrical foam specimens of Al_2O_3-C made with lactose to tannin ratio (L:T) of 5:1, 4:1 and 3:1. Microstructural features of the specimens were examined by scanning electron microscopy (SEM). The obtained results were compared with those of pitch-based specimens and used to evaluate the applicability of the lactose-tannin-based Al_2O_3-C foams for molten steel filtration.

Keywords: carbon-bonded alumina; foam material; binder; mechanical behavior; high temperature

Acknowledgment: The studies were carried out with financial support from the Deutsche Forschungsgemeinschaft (DFG) within Collaborative Research Center SFB 920, Projects C02 and A01, Project-ID 169148856.