ZrO_2 IN REFRACTORY PRODUCTS: CHARACTERIZATION METHODS

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In the process of continuous steel casting, isostatically pressed products are commonly used for flow control. By the combination of an alumina graphite main body material grade and a zirconia graphite slag band grade, thermal shock resistance is combined with enhanced chemi-cal resistance. Thermo-mechanical properties as well as chemical corrosion performance must be currently optimized. It is therefore of paramount importance to characterize the used raw materials. Microstructural information combined with an understanding of the crystallo-graphic phase transformations of zirconia provide predictive capabilities pertaining to the material performance. We present characterization methods for Ca-partially stabilized zirconia, including the in-situ trace element analysis of grains in combination with the charac-terization of the physical properties of zirconia-bearing materials. The application of electron backscatter diffraction (EBSD) and Raman spectroscopy allows deep insights in micro-scale phase transformations. The crystallographic transformation of the zirconia grains during operation is described by elemental distribution mappings. Recrystallization and exsolution phenomena are fundamental and also limiting factors regarding thermal shock resistance; and the chemical wear resistance changes with ongoing recrystallization. Structural modifications accompanied by chemical processes within the affected material are crucial to a better under-standing of refractory materials.

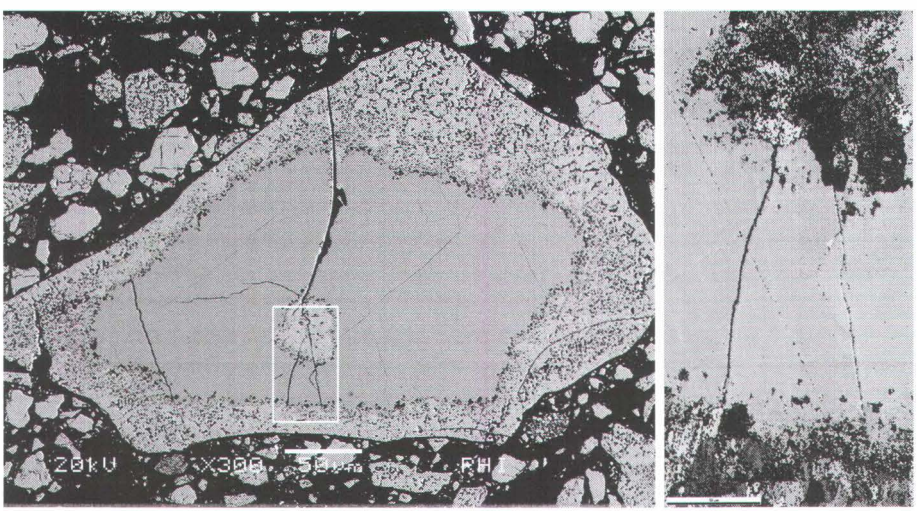

Figure 1. Left: BSE-image of Ca-partially stabilized zirconia showing a recrystallized rim. Scale bar is 50 μm. Right: Crystal orientation map for cubic zirconia. Scale bar is 15 μm.