The aim of this project is the development of new material and engineering concepts to the micro- and macro structuring of carbon free refractory materials for high temperature applications with a high corrosion and thermal shock resistance. Due to the creation of flexible ceramic „spring element“ phases in the refractory matrix and the generation of long-time and temperature stable micro cracks networks thermal shock resistant materials with a low modulus of elasticity and extensive linear thermal expansion in the ceramic system alumina-zirconia-titania (AZT) are developed.

The results had shown a great influence of the sintering condition on the phase formation (spring elements, grain size), the spatial arrangement of the phases and the grain size of the main component alumina. High sintered material (1650°C) exhibits a low CMOR after sintering and an increase of the CMOR after the water quenching from 1200°C to room temperature. In contrast, lower sintered materials (1500, 1550 and 1600°C) show the common thermal shock behaviour of ceramics. Due to the addition of titania and zirconia to the alumina matrix phases such as aluminium titanate, zirconium titanate and titania particles and creation of Z-T-A “spring elements.”

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