

3.1. INFLUENCE OF WATER AND OIL ABSORPTION ON THE DAMPING AND DYNAMIC MODULUS OF ELASTICITY CHARACTERIZATION OF A REFRACTORY CASTABLE

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The damping and the modulus of elasticity can be used to evaluate the level of thermal shock damage, the decreasing in mechanical strength and to monitor the crack and micro-crack configuration in refractory castables. The damping is a sensitive parameter to microstructure changes. It can also be sensitive to humidity and to water and oil absorption into open-porosity. These are important aspects in the circumstances of porosity tests and grinding procedures during the sample preparation and preliminary characterization.

The aim of this work was to study the influence of water and oil absorption on damping and dynamic modulus of elasticity characterization of an alumina based refractory castable using the impact-resonance excitation technique.

Dynamic modulus of elasticity and damping tests applying impact-resonance excitation techniques in accordance to ASTM E 1876-07 were carried out for non-destructive characterization of an alumina based refractory castable.

A representative number of prismatic samples of $25 \times 25 \times 150$ mm in dimensions were prepared and separated into three groups. The first group was submitted to an open-porosity test carried out using water and the second group was immersed in an emulsion of water plus mineral oil (grinding oil) during 10 minutes. The third group was the reference one.

The damping and the modulus of elasticity were measured previous to and after the porosity tests and the immersion, during the samples drying at 110°C , and finally after a 450°C -heat treatment to burn the retained oil in the second group. The reference group was also heat treated. In this study were used two non-destructive testing equipment: a Resonance Frequency Damping Analyzer (Sonelastic-RFDA) and a dynamic E-module meter (Scanelastic).

The damping shows a significant increasing with the water and oil absorption. However, the modulus of elasticity was not as sensitive as the damping. The results show that it is very important to control the contamination by oil and the water absorption to assure a reliable damping measurement in refractory castables.