

The Impulse Excitation technique, an innovative NDT method for microstructure and mechanical properties characterization of refractory materials used in the aluminum industry.

Abstract. Service life evaluation and the characterization of the thermo-mechanical properties is crucial in the development of refractory materials. The Impulse Excitation Technique (IET) is widely recognized as a non-destructive evaluation technique to measure a wide range of microstructure and mechanical properties as function of temperature. The IET is based on the accurate measurement of the resonant frequency and internal friction of a vibrating specimen after it has been excited by a simple tap.

Except for the reliable determination of the dynamic elastic properties of Young's modulus, shear modulus and Poisson's ratio, the IET gives access to investigate the microstructural behaviour of the refractory material as function of temperature.

With dedicated build furnace systems, in combination with advanced signal analysis, it is possible to apply IET in a broad temperature range up to 1700 °C.

The presentation will highlight the advantages of the IET in different application domains with an emphasis on refractory applications.

Keywords: Impulse Excitation Technique (IET), resonant frequency, damping, internal friction, elastic properties, microstructure, refractory materials, high temperature.