

# **Air-coupled ultrasonic testing for quality assurance of ceramic materials**

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Refractory ceramics are produced in large quantities worldwide and are used, for example, in the kiln lining for cement and brick production. The high thermal load in the application also requires a defect-free structure for this mass product. Manufacturers of refractory ceramics are therefore interested in a 100% non-destructive testing in the production process. Since the production of ceramics is an energy-intensive process, the quality of the green bodies should be tested as far as possible before the sintering process in order to detect production defects at an early stage. A non-contact inspection method is particularly necessary for this. Air-coupled ultrasound without coupling agents offers the best prerequisites for this. In the lecture, the possibilities as well as the limits of this method will be presented. The detection of voids or foreign bodies is carried out by amplitude evaluation and is a method that has proven itself over the last few years. For the detection of structural inhomogeneities such as grain size variations and porosities, no industrially applicable, fast and reliable method was known so far. These inhomogeneities initially lead to a density fluctuation, which is associated with a local variation in the speed of sound. The determination of the absolute value of sound velocity from a time-of-flight measurement poses a great difficulty in air-coupled ultrasonic testing. In a cooperation project of FZ-U, RHI and SONOTEC, a special method for measuring the sound velocity and thus for evaluating density fluctuations was developed. For process automation, the influence of the air gap is compensated in a worldwide unique procedure. The test system will be presented during the lecture. The suitability of the method will be demonstrated on the basis of test examples on real ceramics provided by RHI Magnesita.