



**Ultrasonic
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UST = Ultimate Smart Tools

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CRACK DETECTION in CERAMICS

Resonance Ultrasonic Vibrations (RUV) Technology

High accuracy: 91 – 99 percent

High throughput: 2-5 seconds/cycle

Non destructive

In-line & Off-line configuration



[Automatic RUV system](#) (video)



Manual RUV system

RUV TECHNOLOGY

The Resonance Ultrasonic Vibrations (RUV) technique was developed for off-line and in-line non-destructive crack and stress detection in ceramic materials. The RUV methodology relies on deviation of the resonance frequency response curve measured on a sample with sub- millimeter length crack compared to identical non-cracked samples.

The RUV technology allows to (1) reject mechanically unstable ceramic objects before they are introduced into further processing, (2) identify objects with cracks and high stress in real time to avoid in-line breakage, and (3) detect cracked ceramics before they are integrated into final device to avoid product return from the field. RUV system also serves as a process control tool to increase yield by eliminating production flaws caused by mechanical defects.

FREQUENCY CURVE

Through a resonance frequency curve selected from a broad range (20 - 250 kHz) the RUV method enables screen out materials with hidden cracks. A crack introduced into ceramics alters the RUV peak parameters: amplitude, bandwidth and peak position. This is illustrated in Figure 1 for a set of ceramic rings. Specifically, the crack in the ring shows the following features: (1) a frequency shift of the peak position; (2) an increase of the bandwidth, and (3) a reduction of the amplitude. Therefore, the RUV approach is based on a fast measurement and analyses of a specific resonance peak and rejection of the wafer if peak characteristics deviate from the normal non-cracked wafers. Additional RUV feature allows stress inspection caused by package density variation.

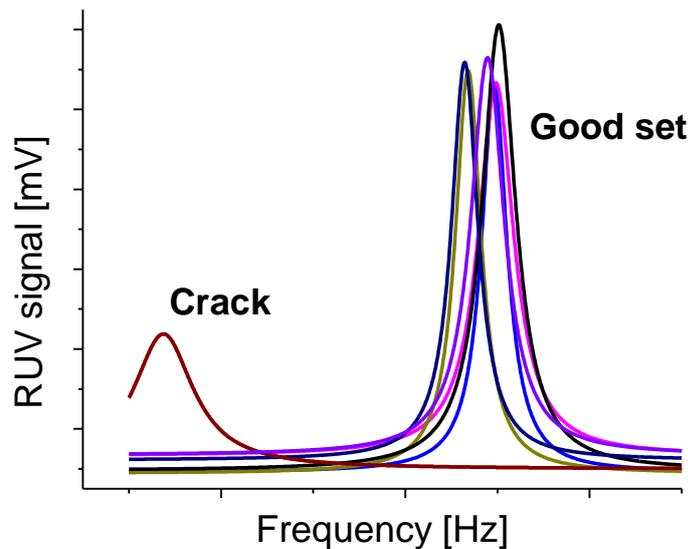


Figure 1: Deviations of RUV peak parameters caused by a crack

The sensitivity of the system, which refers to the length of the cracks, is adjustable to the needs of the user. The rejecting method is based on a statistical approach. In case studies the accuracy of this method approaches 99%. RUV system is used in production of solid oxide fuel cells and metallized ceramic rings.

IN LINE & OFFLINE CONFIGURATIONS

Fully automatic In-line, Off-line and Quality Control RUV Tools are currently available for ceramic products. For technical information and RUV system availability, please contact Ultrasonic Technologies at www.ultrasonictech.com