Ultrasonic Technologies, Inc

UST = Ultimate Smart Tools

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CRACK INSPECTION IN WAFERS

Resonance Ultrasonic Vibrations (RUV) Technology[1]

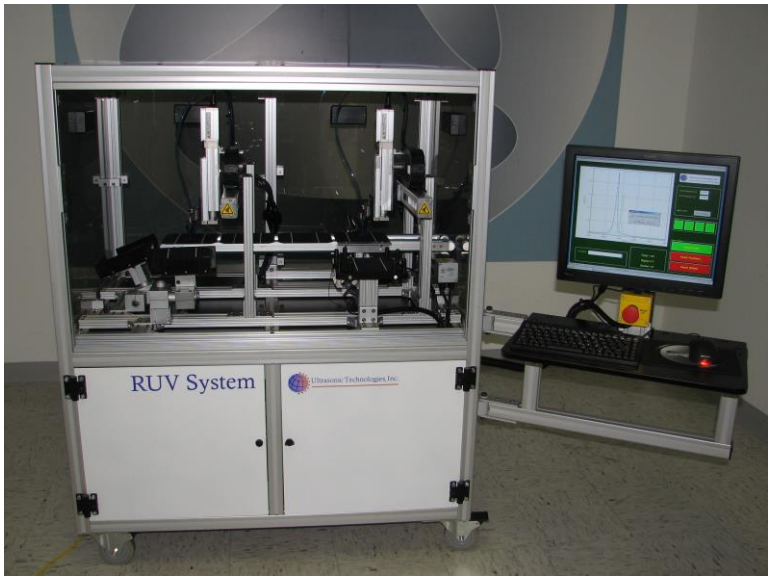
High reliability: 91 – 95 percent

High throughput: 2 seconds

Non destructive

In-line & Off-line configurations

UL certified



[1] US Patents 8,528,407; 9,933,394

RUV TECHNOLOGY

The Resonance Ultrasonic Vibrations (RUV) technique was developed for off-line and in-line non-destructive monitoring of mechanical defects (cracks, stress and delamination) in full-size bare and processed crystalline wafers including 100 microns TAIKO silicon wafers. The RUV methodology relies on deviation of the resonance frequency response curve measured on a wafer with peripheral or bulk internal cracks in comparison with the identical defect-free wafer ultimately improving production yield. The RUV system has already proved cost savings as an in-line and QC tool in Si solar cell, ZrO2 ceramics and $LiTaO_3$ fabrication.

The RUV technology allows (1) identification of wafers with invisible mechanical defects (such as cracks and voids) at various wafer processing steps, (2) in-line characterizing voids in bonded wafers, (3) inspection wafers with build-up stress caused by a ion implantation or thin film layer deposition, and (4) screening of incoming wafers and selection of the most favorable wafer supplier.

FREQUENCY CURVE

Through a resonance frequency curve selected from a broad range (20 - 250 kHz) the RUV method enables crack detection with simple criteria of inspection. A crack introduced into ideal (non-cracked) wafer alters the RUV peak parameters: amplitude, bandwidth and peak position. Specifically, crack in the wafer 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 (Figure 1). Therefore, the RUV approach is based on fast measurement and analysis of a specific resonance peak and identification of the wafer if peak characteristics deviate from the normal non-cracked wafers. In Figure 2 a basic schematic of the RUV system layout is shown.

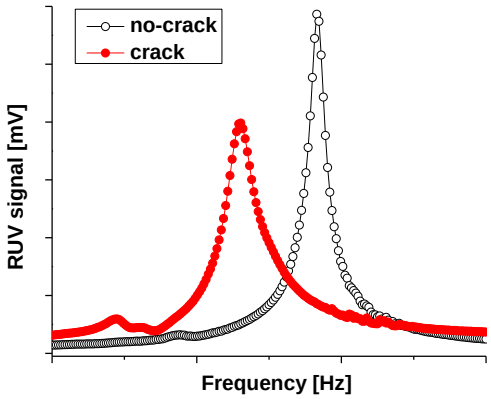


Figure 1: Deviations of RUV parameters caused by a crack

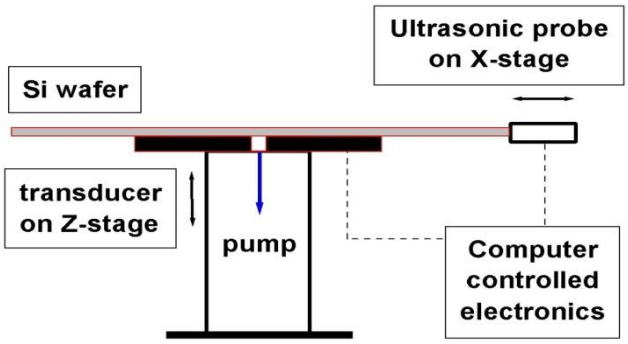


Figure 2: RUV schematic

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 proprietary statistical approach. In case studies the accuracy of this method was between 91 - 95%. **That means that after RUV inspection the breakage caused by cracked wafers is reduced by a factor of 20.** ROI of the RUV system is 6 to 12 months.

IN LINE & OFFLINE CONFIGURATIONS

Fully automatic In-line, Off-line and Quality Control RUV Tools are currently available for bare and processed wafers. For more information and a quote, please contact Ultrasonic Technologies at support@ultrasonictech.com