

Scanning Acoustic Microscopy

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1824

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STRESS DAMAGE CHARACTERISATION UNIT



Acoustic microscopy uses the propagation and reflection of high frequency ultrasonic waves at interfaces where a change of acoustic impedance occurs. By measuring the velocity of back-scattered waves, internal 3-D structures can be visualised. Wave velocity also gives indications of the surface elastic modulus of a material, changes in the modulus can be used to characterise surface damage or crack density.

FACILITIES

The KSI Acoustic Microscope is a combination of a light microscope and an acoustic microscope with the new elastic micro-analysis AMS, frequency tuning and acoustic impedance measurement method. It includes a fully digitised PC based system and high frequency 3-D display.

Frequency range: 100 – 2000 MHz.

Fast scanning: 2.5 sec./image max.

Resolution at 2000 MHz: Approx. 0.4mm.

CASE STUDY— 1

UNBROKEN SCORE IN AIR SURFACE OF 4MM THICK FLOAT GLASS.



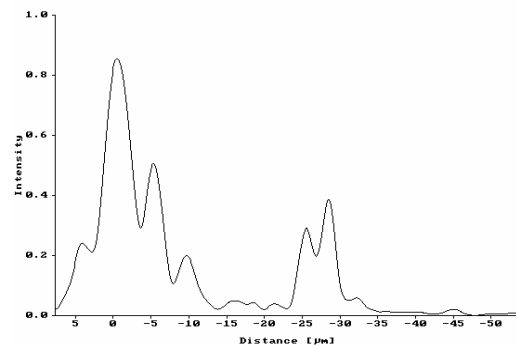
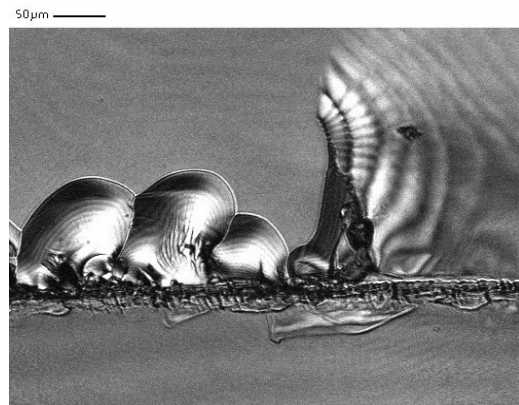
From

analysis of the acoustic signature, the Rayleigh wave velocity on the surface of the material can be found. This velocity can be used to characterise the surface elastic properties (i.e. determine Young's modulus) of the specimen that will have been altered by the presence of surface breaking cracks.

The lower the Rayleigh wave velocity, the greater the density of cracks. The waves can also detect defects in the substructure of the sample, as

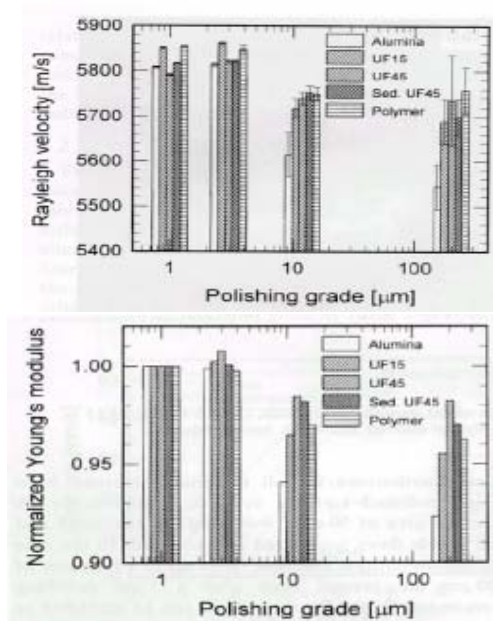
subsurface cracks will result in a change in the ultrasonic signal.

SAM image of the unbroken score in a float glass surface, with corresponding acoustic signature plot



CASE STUDY—2

CHARACTERISATION OF POLISHING-INDUCED SURFACE DAMAGE IN CERAMICS.



Alumina ceramic (white histogram bars) and a range of alumina-SiC nanocomposites (grey shade bars) were polished to a range of surface finishes. The nanocomposites had a smaller reduction in wave velocity/Young's modulus after polishing. (Wu, Lawrence, Roberts & Derby, Acta Materialia, 1998).

For more information on Image Correlation contact:
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