Material Characterization

Application Overview:

Acoustic microscopes work on the principle of partial reflection and partial transmission of ultrasound whenever a sudden change in acoustic impedance is encountered. Material boundaries or property changes/variations can cause and these impedance changes. By measuring the amount of sound returned as a function of the amount of sound entering the boundary, characterizations of the boundaries/materials can be made.

Package Types:

Various

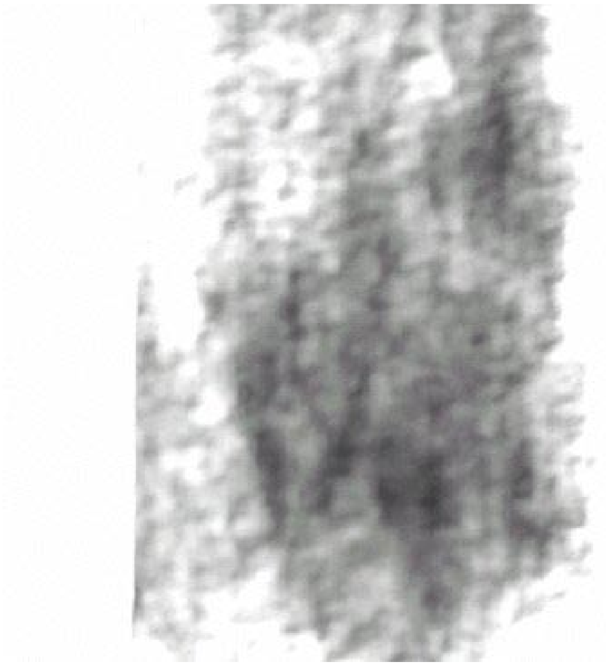
Inspection Standards:

- none -

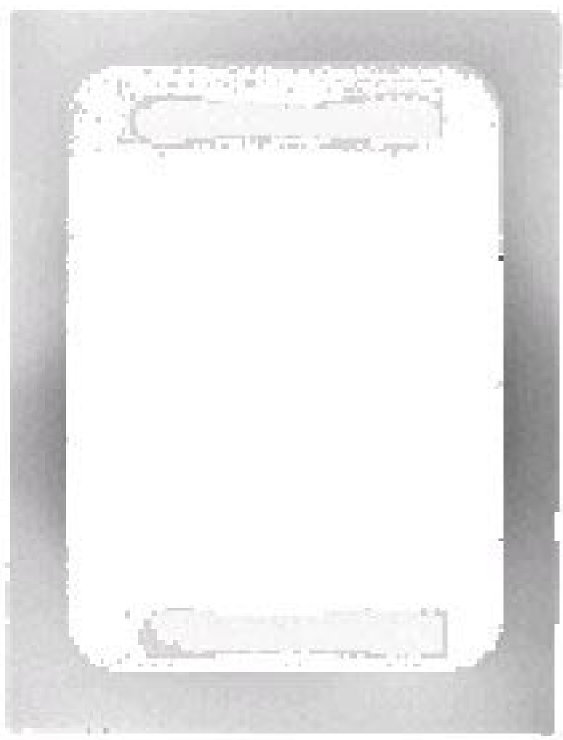
Failure Types Commonly Detected:

Porsosity
Acoustic Impedance
Density
Material thickness
Bondline thickness
Induction hardness measurements
Doping levels
Modulus (Young's, elasticity and others)

Images:



This is a pulse-echo mode image of a porous ceramic substrate. A Loss-of-Back-Wall technique was used to get a porosity mapping of the material. Because a high level of porosity prevents ultrasound from adequately traversing the material, a small amount of sound reaches the back side of the substrate. These areas are seen as dark gray in this image. A low level of porosity allows most of the ultrasound sent into the package to travel to the back surface unimpeded. These areas are displayed as white and bright gray in this image.



This is a Time-of-Flight image of a ceramic device. A glass lid is bonded to a ceramic substrate. An epoxy is utilized to bond the glass to the ceramic base. Too thin of an adhesive layer and the bond may become compromised. Too thick of layer and material is being wasted. It takes more time for ultrasound to travel through a thick layer of epoxy than a thin one, therefore dark areas in this image represent thick layers of epoxy. Bright areas represent thin layers. Automatic calculations can be made to output the maximum, minimum, average and standard deviation of the bond layer thickness.