

acoustic microscopy

Metal alloy

Differences in the mechanical properties of a solid are measurable as a change in the echo signal of the reflected acoustic wave. Growth-related anisotropies of crystal structures, such as dendrites or the intermetallic phase in the residual eutectic can be detected acoustically on polished metal surfaces. At high frequencies ($f > 1.0 \text{ GHz}$) the intermetallic deposits can be seen by the dark needles, the dendrites by their "leaf-like" shape (Fig. a).

The greater penetration depth obtainable at low frequencies ($f < 1.0 \text{ GHz}$) reveals subsurface cavities (Figs. b and c).

Subsurface defects such as cracks, inclusions, pores and stress often cause interference phenomena in the acoustic image, even when they are smaller than the wavelength and therefore beyond the limit of resolution.



Fig. a: Polished cross section of an alloy with intermetallic deposits and impurities

Frequency: 1.1 GHz
Image width: 312 μm

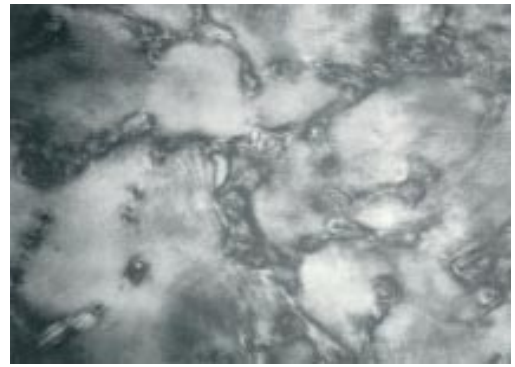


Fig. b: Polished cross section of an alloy with intermetallic deposits and impurities

Frequency: 800 MHz
Image width: 0.5 mm

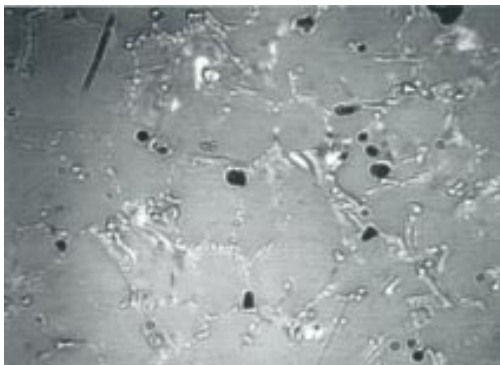


Fig. c: Polished cross section of an alloy with intermetallic deposits and impurities

Frequency: 400 MHz
Image width: 1 mm



Fig. c: Polished cross section of an alloy with intermetallic deposits and impurities, defocused

Frequency: 1.1 GHz
Image width: 0.5 mm