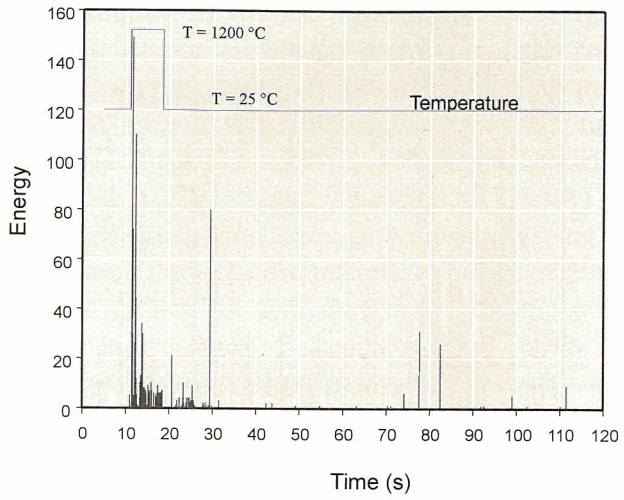

Fig. 5. Acoustic emission energy for the 1200 °C group with pure powder flux during the soldering period.

dB. Since AE signals in this period had less-varied amplitude and smoother amplitude spread, they were thus classified as a continuous type AE signal. As shown in figure 3, the frequency range for major peaks from the frequency spectrum for AE hits before heating period was around 130-140 kHz.

During the heating period, shown in figures 4 and 5, between the 11th and the 13th s after the onset of heating power, there was a sudden increase of high AE counts and high AE energy values of acoustic signals. It was also noted that the average amplitude for the maximum peak in each hit was about 50-60 dB, the average count value was over 200, and the average energy value was more than 100 units. In the frequency spectrum, the major peak was located between 100 and 117 kHz in the low-frequency zone of the spectrum. The maximum amplitude for peaks in the frequency spectrum was at 2.2×10^4 units, which was far higher than that for background noise. The second largest peak was located between 926 and 930 kHz, with an amplitude under 1000 units. During the heating period, a high-amplitude AE hit of 67 dB with a count value of 58 and an energy value of 40 was also observed. When compared to the AE signals produced by the heating source, such an AE signal had a higher peak amplitude, and its counts and energy values decreased more slowly. When heated, a corresponding elastic wave

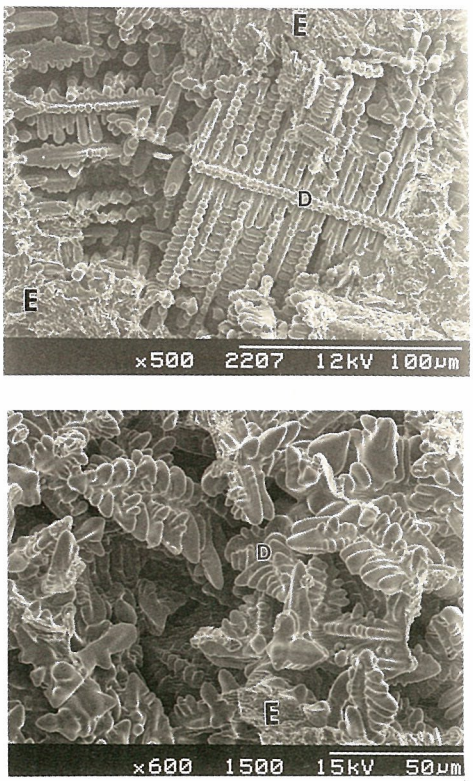

Fig. 6. Surface of a fractured specimen showing the dendritic crystallized structure (D) and equiaxial grains (E) of the parental metal (6a) soldered at 1200 °C and (6b) 1150 °C.

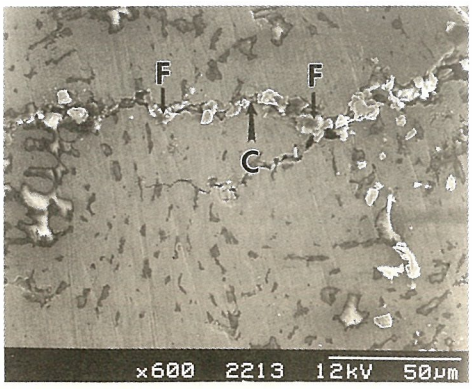

Fig. 7. Crack (C) propagating along the flux inclusions (F) from the the longitudinal surface of specimens at the soldered area.

was generated.

The major source of AE signals during the 1200 °C isothermal soldering period was the alternating frequency from the soldering machine. There was also a