

Fig. 1—Time-temperature cycle during vacuum brazing

Fig. 2—Time-temperature cycle during vacuum brazing

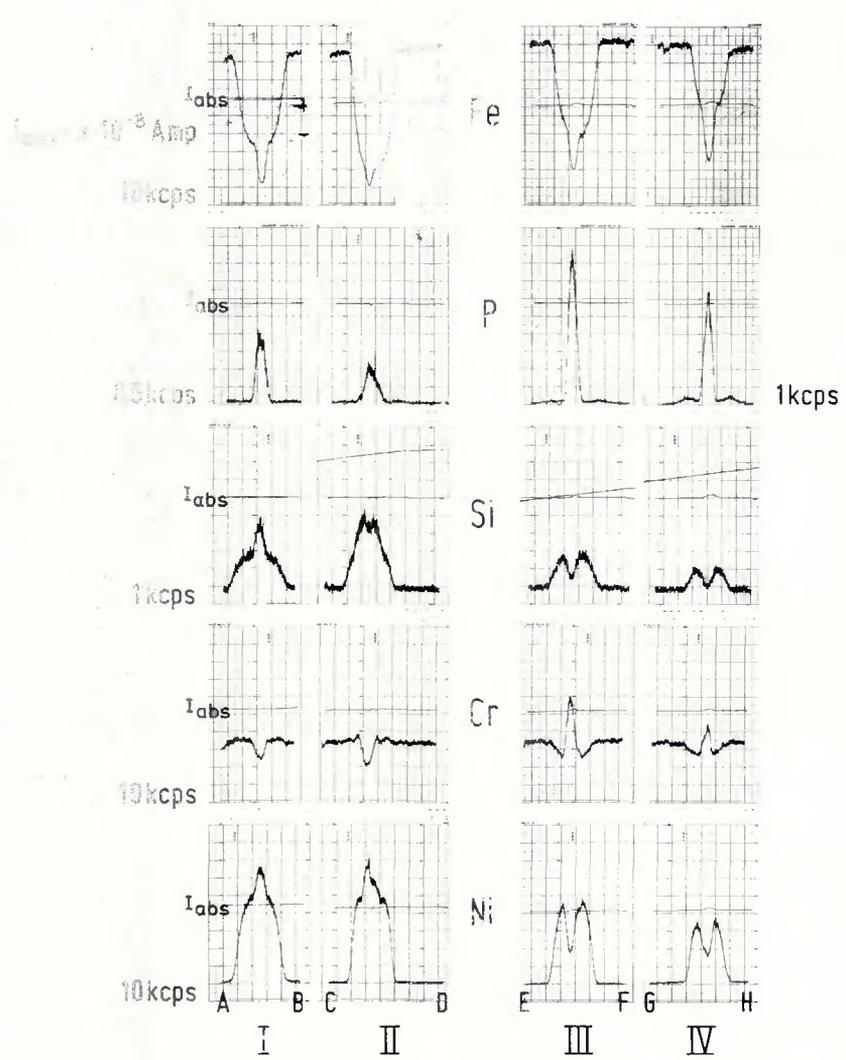


Fig. 3—EDS line scans; filler metal—base metal—brazing temperature: I—BNi-20.3Cr-11.5Si-0.5P, AISI 321, 1433 K or 1160 °C(2120 °F); II—BNi-20.3Cr-11.5Si-0.5P, AISI 321, 1343 K or 1070 °C(1958 °F); III—BNi-14.8Cr-8Si-3P-3Fe, AISI 321, 1403 K or 1170 °C(2666 °F); IV—BNi-14.8Cr-8Si-3P-3Fe, AISI 321, 1323 K or 1050 °C(1922 °F)

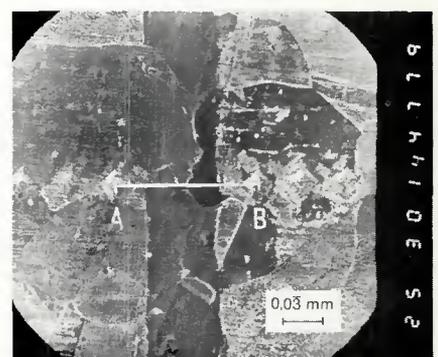


Fig. 4—SEM photomicrograph of a joint brazed at 1433 K or 1160 °C (2120 °F) / 10 min. Heat treatment—1323 K or 1050 °C (1922 °F) / 60 min; base metal—AISI 321; filler metal—BNi-20.3Cr-11.5Si-0.5P; ion etching

1050 °C (1922 °F) and held there for about 10 min. After that time temperature ramp up to brazing temperature were run through with the maximum heating rate of the furnace to avoid liquation. All brazed charges cooled in furnace down to 1273 K or 1000 °C

(1832 °F) and from that temperature by inert gas sweeping. The filler metals were used as powders and placed at the samples without cement. A joint clearance of 25 μm (0.002 in.) was selected for all samples. The clearance was adjusted exactly by

foils of the same material as the base metal. A special fixture was used to get an exact parallel joint clearance for tack welding and to adjust the overlap distance. Samples for structure investigations were worked out of the brazed AWS single-lap shear test specimen blank by electrical discharge machining.

Structure of Brazed Joints

Investigations by SEM with EDS and EPMA Methods

To gain knowledge about the structure of the brazing seam of brazed joints, investigations by SEM with EDS and EPMA methods were made. The results given by the energy dispersive spectrometer investigations showed the different concentrations of the interesting elements in the brazing seam. However these results, pointed out at different samples brazed with different filler metals and brazing temperatures, could not be compared quantitatively. Therefore, electron probe microanalysis had to be used to get an indication of how the elements are distributed in the brazing seam. Two different metals in combination with one base metal and two different

