

ABSTRACT

KEYWORDS: [Sintering, TMA (dilatometry), diffusion-welding, high temperature deformation behaviour, gas-filled pores, kinetics, phenomenology]

Isothermal deformation behaviour of welded joints with one of the weld components produced through P/M route has been studied over a wide temperature range. Sintered copper, nickel and bronze have been taken up for the investigation.

Porous samples were produced through multiple stages of pressing and sintering. The microstructure of these samples consisted of isolated pores. These samples were then diffusion bonded under varying bonding conditions. The following diffusion bonded couples were produced for investigation - Cu(p)/Cu(p), Cu(p)/Cu(s), Cu(s)/Cu(s), Ni(p)/Ni(p), Ni(p)/Ni(s), Ni(p)/Fe(s), Ni(p)/Stainless steel, Bz(p)/Bz(p), Bz(p)/Cu(s) and Bz(s)/Bz(s). The bonding variables were temperature, time and atmosphere.

The experimental investigations consisted of dilatometry, metallography and x-ray diffraction studies. Studies were also repeated on sintered and hot pressed samples to identify the influence of various parameters.

The following observations have been made:

- a) Copper P/M joints show 4 distinct type of high temperature behaviours
 1. Instantaneous expansion followed by slow rate expansion,
 2. Continuous contraction,
 3. Continuous expansion,
 4. Delayed expansion.
- b) Nickel and bronze joints have shown only contraction when

held at elevated temperatures.

A phenomenological model to explain the observed behaviour has been proposed.