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Influence of Brazing Process Parameters on the Mechanical Properties of Nickel Based Superalloy

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Abstract : A common nickel based superalloy Inconel625 was brazed with Ni-base braze filler material (AMS4777) containing melting-point-depressants such as B and Si. Different braze gaps, brazing times and forms of braze filler material were tested. It was determined that the melting point depressants B and Si tend to form hard and brittle phases in the joint during the braze cycle. Brittle phases significantly reduce mechanical properties (e. g. tensile strength) of the joint. Therefore, it is important to define optimal process parameters to achieve high strength joints, free of brittle phases. High ultimate tensile strength (UTS) values can be obtained if the joint area is free of brittle phases, which is equivalent to a complete isothermal solidification of the joint. Isothermal solidification takes place only if the concentration of the melting point depressant in the braze filler material of the joint is continuously reduced by diffusion into the base material. For a given brazing temperature, long brazing times and small braze filler material volumes (small braze gaps) are beneficial for isothermal solidification. On the base of the obtained results it can be stated that the form of the braze filler material has an additional influence on the joint quality. Better properties can be achieved by the use of braze-filler-material in form of foil instead of braze-filler-material in form of paste due to a reduced amount of voids and a more homogeneous braze-filler-material-composition in the braze-gap by using foil.

Keywords : diffusion brazing, microstructure, superalloy, tensile strength
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