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# Microstructural Characterization of Creep Damage Evolution in Welded Inconel 600 Superalloy

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**Abstract :** Superalloys are used in components that operate at high temperatures such as pressure vessels and heat exchanger tubing. Design standards for these components must consider creep resistance among other criteria. Fusion welding processes are commonly used in the industry to join such components. Fusion processes commonly generate three distinctive zones, i.e. heat affected zone (HAZ), namely weld metal (WM) and base metal (BM). In nickel-based superalloy, the microstructure developed during fusion welding dictates the mechanical response of the welded component and it is very important to establish these effects in the mechanical response of the component. In this work, two plates of Inconel 600 superalloy were Gas Metal Arc Welded (GMAW). Creep samples were cut and milled to specifications and creep tested at a temperature (650 °C) using stress level of 350, 300, 275, 250 and 200 MPa. Microstructural analysis results showed a progressive creep damage evolution that depends on the stress levels with a preferential accumulation of creep damage at the heat affected zone where the creep rupture preferentially occurs owing to an austenitic matrix with grain boundary precipitated of the type Cr23C6. The fractured surfaces showed dimple patterns of cavity and voids. Results indicated that the damage mechanism is due to cavity growth by the combined effect of the power law and diffusion creep.

**Keywords :** austenitic microstructure, creep damage evolution, heat affected zone, vickers microhardness
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