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Effects of the long-time thermal exposure on the microstructure and mechanical properties of laser weldings of Inconel 617

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Abstract: During thermal exposure between 500 h and 7000 h at 850 °C and 950 °C, Ti(C,N), M₆C-type (Ni,Co,Cr)₃Mo₃C, M₂₃C₆-type (Cr,Mo,Ni)₂₃C₆ carbides and non-topological close-packed phases (TCP) phases formed in the welds. M₆C and M₂₃C₆ carbides formed due to both the reaction between C, Mo and Cr and the dissociation of M₂₃C₆, M₆C and Ti(C,N). The coarsening (Ostwald ripening) rate of M₆C carbides was greater than that of M₂₃C₆ carbides. The area fractions and average diameters of M₂₃C₆ carbides increased due to the long-range diffusion of Cr atoms at 950 °C. Hardness of weld metals decreased with increasing exposure time both at 850 °C and 950 °C due to a decrease of Mo and Cr in solution. From 500 h to 7000 h, the impact energy values of the weld metals exposed

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