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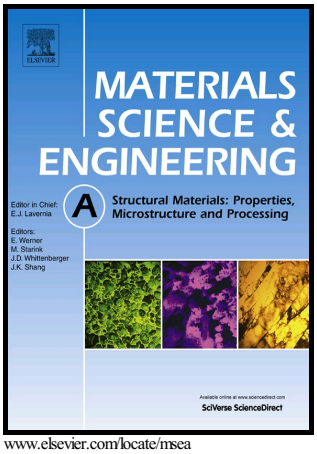

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Abstract

Fiber laser-welded joints of T-250 maraging steel with Cu layer and aging treatment were assessed with respect to tensile properties, microstructure and fractography. The hybrid process based on Cu layer and aging temperature was designed and optimized. All the welded joints fractured in the weld metal region. The approach of electroplating Cu into the weld metal was a practical option. Cu in the weld metal introduced ε-Cu precipitates, leading to increase in strength, decreased reverted austenite at the grain boundaries and increased reverted austenite in the matrix, which was beneficial to toughness. High strength-high toughness welded joint was successfully obtained using the hybrid process. The strength and toughness of welded joint were simultaneously over 90% of the parent metal in the regulation window. The main controlling principle of the hybrid process was that the aging temperature (T) and Cu layer (t) meets the following criteria: $f(t)_2 < T < f(t)_1$, where 587 ^{o}C $<$T$<$610 ^{o}C，17.5 μm$<$t$<$60 μm.

Keywords: strength and toughness of maraging steel; fiber laser welding; hybrid process design; copper; ε-Cu precipitate; reverted austenite