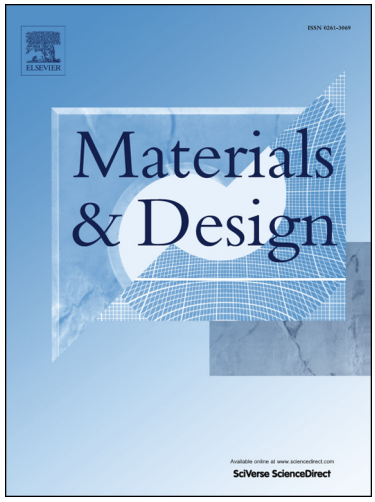

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Influence of Martensite-Austenite Constituents Formed at Different Intercritical Temperatures on Toughness

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Abstract

The objective of the present study is to elucidate the impact of Martensite-Austenite (M-A) constituents formed at different intercritical temperatures on toughness. Gleeble thermal simulation technique has been used to produce different intercritically reheated coarse grained heat affected zone (ICCGHAZ) microstructures corresponding to different reheating temperatures between Ac_1 and Ac_3. The instrumental Charpy impact test results of dual pass thermal simulation showed that Charpy impact toughness improved with the increasing of second peak temperature. The fraction of M-A constituent was similar at each temperature. Near-connected coarse necklacing M-A constituents (2.4 μm) formed at 760°C (near to Ac_1) led to the worst toughness (42 J) while those formed at 800°C and 840°C (near to Ac_3) resulted in better toughness, respectively 80 J and 105 J. M-A constituents formed at 800°C were still coarse (2.2 μm) but had larger interspace compared to 760ºC. And those formed at 840°C were refined (1.9 μm) and well dispersed by matrix. Notable difference in toughness values is attributed to the size and distribution of M-A constituents formed at different intercritical temperatures. It is possible to achieve better toughness if M-A constituents are well controlled: smaller in size and larger in interspacing.

Keywords: Martensite-Austenite Constituents; Intercritically Reheated Coarse-Grained Heat-Affected Zone; Intercritical Region; Thermal Simulation; Charpy Impact Toughness

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