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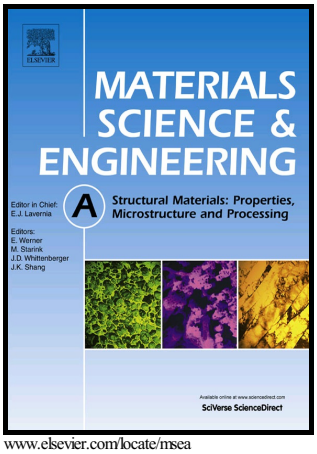

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Mechanical Properties and Microstructure of Laser Welded Ti–6Al–2Sn–4Zr–2Mo (Ti6242) Titanium Alloy

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Abstract

Room temperature tensile properties and microhardness of a laser welded Ti–6Al–2Sn–4Zr–2Mo (Ti6242) titanium alloy sheet were examined and correlated to the microstructure evolution across the weld. Tensile testing integrated with the optical image correlation Instron® system indicated that the average yield strength (YS), ultimate tensile strength (UTS), and total elongation of the weldment were respectively 88 %, 87 %, and 69 % of the corresponding base material (BM) values. Electron probe microanalysis (EPMA) demonstrated a uniform distribution of the main alloying elements across the weld. The hardness raised increasingly from the BM toward the heat affected zone (HAZ) and the fusion zone (FZ) due to mainly a higher α volume fraction in HAZ and acicular α' martensite formation in the FZ. Because of the higher hardness of the HAZ and FZ, a higher YS for the weldment relative to the BM would be expected. However, the lower YS as well as the lower UTS of the weldment can be explained by