

Accepted Manuscript

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PII: S0924-0136(17)30621-0
DOI: <https://doi.org/10.1016/j.jmatprotec.2017.12.030>
Reference: PROTEC 15567

To appear in: *Journal of Materials Processing Technology*

Received date: 28-6-2017
Revised date: 28-11-2017
Accepted date: 21-12-2017

Please cite this article as: Yin G, Xu P, Gong H, Cui H, Lu F, Effect of interlayer thickness on the microstructure and strength of WC-Co/Invar/316L steel joints prepared by fibre laser welding, *Journal of Materials Processing Technology* (2010), <https://doi.org/10.1016/j.jmatprotec.2017.12.030>

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Effect of interlayer thickness on the microstructure and strength of WC-Co/Invar/316L steel joints prepared by fibre laser welding

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Abstract: Increasing the thickness of the Invar ($\text{Ni}_{42}\text{Fe}_{50.9}\text{Co}_{0.6}\text{Mn}_{3.5}\text{Nb}_3$) interlayer from 1 to 1.5 mm resulted in a continuous metallurgical bonding, free of voids and oxide films. Invar as a pre-placed buffer also led to higher bending strength because of the stress relaxation. When the thickness was increased to 2 mm, the porosity in the fusion zone increased and cracks developed near the fusion boundary on the WC-Co side, lowering the strength. The fusion boundary, heat affected zone and the fusion zone on the WC-Co side were susceptible to cracking. Transmission electron microscopy revealed high densities of dislocations. Energy dispersive spectroscopy suggested that long-range solute diffusion occurred inside the WC grains and at the

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