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Microstructure and mechanical behavior of dissimilar AISI 304L/WC-Cocermet rotary friction welds

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Abstract: In this work, dissimilar rapid Rotary Friction Welding of WC-Co cermet to AISI 304 L austenitic stainless steel hasbeen conducted using different friction times. The microstructural examination showed that the increase infriction time from 4s to 12s increases the grain size in both the heat affected zone and the thermo-mechanicallyaffected zone and enlarges the extent of the fully dynamically recrystallized zone. EDS analysis revealed theexistence of a FeeCreW rich band along the WC-Co/AISI 304 L interface in the central region of the weld jointand its absence from the peripheral region. The formation of this band suggests the occurrence of a mutual inter-diffusion between the cermet and the steel which enhanced the metallurgical bonding of the interface. Themechanical behavior investigated by nano-indentation measurements and nano-scratch tests revealed that, re-gardless the friction time effect and considering the 304 L ASS side, the highest hardness (HIT) and the lowestYoung's modulus (EIT) values were recorded in the fully dynamically recrystallized zone. Besides, the increase offriction time resulted in an increase of hardness and Young's modulus of each zone in the AISI 304 L steel side.

Keywords : Rotary friction welding, WC-Co cermet, AISI 304L ASS, microstructure, Intre-diffusion, Bonding strength