

Effect of WC-Co cermet positioning and NiCr interlayer on the microstructure and mechanical response of the dissimilar WC-Co / AISI 304 L rotary friction joint

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Abstract

In this work, incompatible properties of WC-Co cermet and AISI 304 steel were combined in the same component using rotary friction welding (RFW) process. The dissimilar joints were performed using a ductile NiCr interlayer with the change in the WC-Co cermet positioning i.e., fixed rotary side and feeding side. Similar microstructure across the weld joints was obtained of the different welding configurations that produced similar behavior in hardness and elastic modulus. A diffusion zone was formed at the weld interface as a result of the mutual inter-diffusion of both cermet (W and Co) and steel elements (Fe, Cr and Ni) that enhanced with the insertion of the interlayer when the cermet was fixed in rotary side. The introduction of the NiCr interlayer was beneficial to relax the residual stresses and improving the shear strength of the WC-Co cermet/AISI 304L steel joints, which is promising technology for drilling tools industries.

Keywords: Rotary friction welding; WC-Co cermet; NiCr interlayer; interface; microstructure; mechanical properties.