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Microstructural and mechanical properties of WC-Co/1020 steel joints obtained by oxyacetylene and TIG brazing process

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Abstract : In this work, the microstructure evolution and the mechanical behavior of WC-Co / 1020 steel joint obtained by oxyacetylene and tungsten Inert Gas (TIG) brazing process are investigated. The maximum peak temperature induced by TIG process and the introduction of shielding gas causes a remarkable inter-diffusion at WC-Co/braze interface. The diffusion of Co Towards the braze in the interface obtained by TIG process is greater compared with the oxyacetylene ones. On the other side, a short range diffusion of Ni towards the WC-Co is observed. This phenomenon leads to create a new zone devoid in Co elements with high WC particle concentration at WC-Co/braze interface using TIG brazing process. The mechanical behavior is carried out through shear and micro-hardness test, they show that the presence of the new zone concentrated in WC particles beside the hard metal, makes the joint less strong than the one obtained by the oxyacetylene brazing, despite the inter-diffusion of Co and Ni elements in the interface. However, special shear test (SST) reveals that the joint made by the TIG process is resistant as much as the oxyacetylene brazing one.

Keywords : WC-Co cermet, TIG brazing, Interface, inter-diffusion, mechanical behavior