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Microstructural and hardness investigations on a dissimilar metal weld between low alloy steel and Alloy 82 weld metal

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Abstract

The investigation on microstructure and hardness at the fusion boundary (FB) region of a dissimilar metal weld (DMW) between low alloy steel (LAS) A508-III and Alloy 82 weld metal (WM) was carried out. The results indicated that there were two kinds of FBs, martensite FB and sharp FB, with obvious different microstructures, alternately distributed in the same FB. The martensite FB region had a gradual change of elemental concentration across FB, columnar WM grains with high length/width ratios, a thick martensite layer and a wide heat affected zone (HAZ) with large prior austenite grains. By comparison, the sharp FB region had a relatively sharp change of elemental concentration across the FB, WM grains with low length/width ratios and a narrow HAZ with smaller prior austenite grains. The martensite possessed a K-S orientation relationship with WM grains, while no orientation relationship was found between the HAZ grains and WM grains at the sharp FB. Compared with sharp FB there were much more Σ3 boundaries in the HAZ beside martensite FB. The hardness maximum of the martensite FB was much higher than that of the sharp FB, which was attributed to the martensite layer at the martensite FB.

Keywords: Dissimilar metal welds; martensite fusion boundary; sharp

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