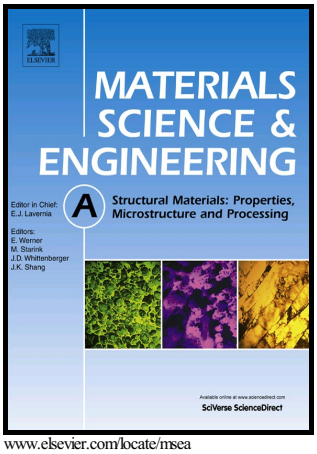

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Key words: Reduced activation ferritic-martensitic steel, electron beam welding, δ-ferrite, EBSD, PWHT, impact toughness.

Abstract

The microstructure and mechanical properties of electron beam welded joints of reduced activation ferritic-martensitic steel in the as-welded and post-weld heat treatment (PWHT) states have been explored. The as-received base metal (BM) was in normalised and tempered condition. The PWHTs employed include post-weld direct tempering (PWDT) at 760^{o}C/90 min/air cooling and (ii) re-austenitizing at 980^{o}C/30 min/air cooling+ tempering at 760^{o}C/90 min/air cooling (PWNT). The BM microstructure was composed of fully tempered lath martensite with prior austenite grain and martensite lath boundaries decorated with $M_{23}C_6$ type carbides whereas intra-lath regions majorly displayed MX type carbides. In the as-welded state, the fusion zone (FZ) contained martensite in coarse grains and small amount of δ-ferrite with no evidence for precipitation of $M_{23}C_6$ and MX either in intra- or inter-granular regions. The heat affected zone (HAZ) was made up of martensite in fine grains without any δ-ferrite and with subtle variations in microstructure across the HAZ. The as-