

C. Microstructure change of $(\text{Cr,Fe})_{23}\text{C}_6$ in high chromium Fe-Cr-C hardfacing alloys

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A series of high chromium Fe-Cr-C hardfacing alloys were made by gas tungsten arc welding (GTAW), to study and characterize their microstructures. In this research, chromium and graphite alloy fillers were used to deposit coatings on ASTM A36 steel substrates. These coatings were especially designed to vary the size and proportion of the $(\text{Cr,Fe})_{23}\text{C}_6$ carbides that are present in the microstructure at room temperature. Depending on the three different graphite additions of those alloy fillers, hypoeutectic, eutectic and hypereutectic microstructures were obtained on coated surfaces. No crack formation was found on the coatings. According to the X-ray diffraction analysis and microstructure characteristics, the hypereutectic composites consist of three phases, i.e. Cr-Fe solid solution (α), $(\text{Cr,Fe})_{23}\text{C}_6$ and trace amounts of $(\text{Cr,Fe})_7\text{C}_3$. Massive $(\text{Cr,Fe})_{23}\text{C}_6$ contain $(\text{Cr,Fe})_7\text{C}_3$ in the center, cause it's high hardness value up to HRC 70. And the massive $(\text{Cr,Fe})_{23}\text{C}_6$ are surrounded by eutectic structure to restrain crack appear. All the microstructure constituents were rationalized in terms of ternary diagram.