Electrolytic Refining of High Carbon Ferrochromium to Produce Pure Ferrochromium in NaCl-KCl Melt

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In this paper the electrolytic refining of remelted high carbon ferrochromium (HCCrFe) to produce pure ferrochromium in molten salts was investigated. The remelted HCCrFe was employed as the working electrode, tungsten as the counter electrode, and Ag/AgCl as the reference electrode, to establish a three-electrode cell. Potentiostatic electrolysis (anode potential, 0.3 V vs Ag/AgCl) was conducted in NaCl-KCl melt at a temperature of 710°C. The cathode product was examined by x-ray diffraction (XRD), elemental analysis and x-ray photoemission spectroscopy (XPS). The results indicate that pure ferrochromium with low contents of C, S, and P has been successfully prepared by this method. In addition, the left anode residue was also characterized by scanning electron microscopy (SEM) and energy disperse spectrum (EDS), exhibiting porous appearance with a large amount of carbon contained. Subsequently, galvanostatic electrolysis was performed with different current densities (0.33 A·cm⁻², 0.50 A·cm⁻², 0.58 A·cm⁻² and 0.66 A·cm⁻²). The composition and microstructure of the deposited ferrochromium under these different conditions were analyzed by XRD and SEM. It is found that with the increase of current densities, the particle size of cathode product becomes coarser and tends not to be oxidized.

Keywords: high carbon ferrochromium, pure ferrochromium, electrolytic refining, molten salts

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