EAF Stainless Steel Refining - Part II: Microstructural Slag Evolution and its Implications for Slag Foaming and Chromium Recovery

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The microstructural slag evolution during the electric arc furnace (EAF) austenitic stainless steelmaking was investigated with respect to its effect on chromium recovery and slag foaming. Two distinct EAF types were followed up: (1) an eccentric bottom tapping furnace (EBTF) and (2) a spout tapping furnace (STF). Slag samples were collected from 36 industrial heats at three (EBTF) or five (STF) distinct moments in the process. The microstructure of the slag samples was characterised with electron probe microanalysis using energy dispersive spectroscopy (EPMA-EDS) and X-ray diffraction (XRD). From the microstructural analysis it is concluded that at the processing temperature the slag consists of a liquid slag matrix, two different types of metallic particles and MgO×(Al,Cr)2O3-based spinel particles. The evolution of the microstructure is highlighted, the interactions between the phases are discussed and the effects of changing conditions on the slag microstructure are illustrated by thermodynamic calculations. Special attention is given to the effect of slag basicity on the activity of chromium oxide in the slag. It is shown that a thorough study of the microstructural evolution of the slag is instrumental to understanding and improving slag foaming and chromium recovery.

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