Effect of MgO on phase structure and evolution of steelmaking slag during cooling

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ABSTRACT

The steel industry produces between 130-160 million tons of steelmaking slag each year in China, but its utilization rate is only 30%. The use of steelmaking slag has been limited due to its volume expansion characteristics. Volume expansion is caused by the hydration of free lime (*f*-CaO), free MgO, and the dusting due to the on version of α'-Ca_2SiO_4 (α'-C_2S) to γ- Ca_2SiO_4 (γ-C_2S) in the slag. One of the main sources of *f*-CaO is the decomposition of Ca_3SiO_5 (C_3S) during the cooling process. Since the chemical composition of steelmaking slags from different sources varies greatly, it can be expected that the mineral composition of steelmaking slag is also very different. In order to provide good steel/slag reaction and dephosphorization kinetics, large amount of dolomite is added to the converter during the steelmaking process. The addition of dolomite and the loss of MgO refractory material in the BOF lining results in a MgO content of 0.4-14% in the slag, which also causes stability problems in steelmaking slag. In this work, the effects of different MgO contents on the RO content, and microscopic morphology were studied to clarify the distribution pattern of MgO and FeO in RO in steelmaking slag. The phase evolution during cooling of molten steelmaking slag was investigated to analyze the growth mechanism of its main physical phases containing Ca_2SiO_4, Ca_3SiO_5, and RO. It is expected that the optimization of the steelmaking slag mineral phase, the enhancement of slag activity and the improvement of stability can be achieved to provide a theoretical basis for steelmaking slag treatment.