Development of Analytical Methods for Free-MgO in Steelmaking Slag

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Steelmaking slags have been widely used as aggregate for roadbeds and civil engineering. However, when used as aggregate, slag sometimes expands as a result of hydration, resulting in the evolution of cracks at the surface of roads. Because free magnesium oxide (free-MgO) as well as free calcium oxide in the slag are potential causes of this expansion, analytical methods to determine the free-MgO in slag for accurate evaluation of expansion are required. Based on a combination of chemical extraction and thermogravimetry (TG), an accurate method to determine the free-MgO in steelmaking slag was developed. In this method, the free-MgO and magnesium hydroxide (Mg(OH)$_2$) in the steelmaking slag are dissolved in an ethyleneglycol solution containing iodine and ethanol when heated. The amount of the magnesium species dissolved in the solution is determined by inductively coupled plasma atomic emission spectroscopy (ICP-AES). The amount of (Mg(OH)$_2$) in the slag is determined separately by TG, and the result is then subtracted from that of the magnesium species dissolved in the ethyleneglycol to obtain the amount of free-MgO. The newly-established method enables determination of free-MgO in steelmaking slag at the 0.1 mass% level.

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gravimetric analysis of the sample after EG treatment. The content of free-MgO is obtained from the difference between the two results. This method enables evaluation of free-MgO in slag. It is possible to apply this technique to studies of aging treatment conditions, indexes of criteria for judging that shipment of slag is possible, and other fields.