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D. Satish Kumar, Rameshwar Sah, Sarbendu Sanyal, Ganapathi Prasad

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D. Satish Kumar, Rameshwar Sah, Sarbendu Sanyal and Ganapathi Prasad

JSW Steel Ltd. Vijayanagar Works, Toranagallu, Karnataka – 583275

E-mail: satishkumar.dabbiru@jsw.in

Abstract

An integrated steel plant generates 200-250 kg of steel making slag for every tonne of steel produced. These slags contain non-uniformly distributed iron in metallic form, inevitably carried into the slag pot during de-slagging. The steel slag is subjected to crushing/magnetic separation to generate different sizes of slag products with varying metallic values. Based on size and metallic content, these products are recycled in sinter base mix, iron making units and as scrap in steel making process. Hence accurate analysis of Fe-metallic in these samples is imperative for better process control. Due to non-uniform mixing and solidification of steel & slag in de-slagging and dumping practice, precise quantification of the metallic portion in these samples is extremely difficult. Existing methods followed by slag processing agencies has always been doubtful. Moreover, uniformity of constituents in a small sample size cannot be ensured even by best of the sampling techniques. In the present work, all the slag products have been subjected to different measurement techniques to develop a method to determine the metallic iron content accurately in the steel-making slags. Separate methods have been formulated for low metallic and high metallic content slag samples based on the dominant characteristics. Specific density balance and grinding-sieving methods are proposed for more practical and accurate measurement. Best sampling technique and optimum sample size have also been suggested for each method. In addition to increase in the efficiency of the process, where it is recycled, accurate analysis of Fe-metallic in slag helps in improving the magnetic separation technique and the process of its application.

Introduction

Integrated steel plants generate iron making and steel making slags. Most of the iron making slags is utilized in cement and construction industry but the steel making slags are generally dumped, primarily due to its high metallic content and expansion behavior. Due to distributed metallic content, steel slags have limited applications in cement and construction industry even after metallic separation. The metal in the steel slag mainly comes from the BOF process, where some amount of steel is inevitably left back in converter and is carried to slag pot during final de-slagging and subsequently to the pit. Additionally, small droplets of metal (< 0.5 mm size) are distributed uniformly in slag. These metallic particles are entrapped during the slag foaming in the BOF process and remain suspended due to the wetting characteristics of high FeO in BOF slag. In slag pit the bulk metal undergoes cooling and solidification and gets intimately mixed mechanically and chemically with the slag. Hence the magnetic and non-magnetic phases