

2nd World Congress and Expo on

Recycling

July 25-27, 2016 Berlin, Germany

Recycling of steelmaking dusts through dissolution and electrowinning in deep eutectic solvents

Ashraf Bakkar^{1,2} and Volkmar Neubert¹¹Institut für Materialprüfung und Werkstofftechnik Dr. Neubert GmbH, Germany²Suez University, Egypt

World production of steel is about 1.6 billion tons annually. About one third of this amount is produced in electric arc furnace (EAF), which evolves about 20 kg of dust per ton of steel. Thus, more than 10 millions of dust waste is formed annually during steelmaking in EAFs worldwide. Recycling of this dust in iron- or steel-making is hazardous and therefore it is mostly dumped. The dust is rich in Fe and Zn (from galvanized ferrous scraps charged to EAF). It contains also elements such as Pb, Cr, and Cd. These toxic elements led the EAF dust to be categorized as hazardous waste, where they leach in water and pollute groundwater. Such dust waste can be also resulted from other steelmaking processes in cupola furnace and other steel converters. In this contribution, we present our results of recent research on recycling of steelmaking dusts evolved from EAF, cupola furnace, and steel converter through selective dissolution of Zn and Pb in deep eutectic solvents composed of mixtures choline chloride with urea and/or ethylene glycol. About 60% of Zn and 40% of Pb found in EAF dust as complex compounds were selectively dissolved. The resultant electrolyte was then used to electrowin Zn-Pb alloys. Pure Zn, which has a very high economical value, can also be electrowon separately. The residual dust, after its extraction in deep eutectic solvents, with lower Zn and Pb and higher contents of Fe oxides can be recycled in steelmaking processes. Moreover, the lowering Zn and Pb contents make the residual dust to be suggested for in corporation in cement synthesis. This approach was also applied for treating dusts evolved from other steelmaking processes and showed promising results.

Biography

Ashraf Bakkar has obtained his PhD in Materials Engineering and Corrosion from Technische Universität Clausthal, Germany in May 2005. He conducted his scientific research and development in the field of Corrosion and Electrometallurgy in Institut für Materialprüfung und Werkstofftechnik Dr. Neubert (DN) GmbH at Clausthal, Germany (2005-08). He worked as Assistant- and Associate-professor in Metallurgical and Materials Eng. Dept., Suez University, Egypt (2008-2013). He is the Head of Environmental Eng. Dept. at Umm Alqura University, Saudi Arabia. His scientific co-operation with Prof. Neubert (Director of DN) has been continued since 2001. They are currently conducting recent research on recycling of dusts evolved from different Egyptian and German steelmaking fields. He has about 35 scientific contributions published as patents, journal papers, and conference articles.

ashrafbakkar@yahoo.com

Notes: