

## Non-Waste Utilization of Copper Smelting Slags for Production of Demanded Products

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**Abstract :** Smelting of copper matte is followed by production of a large amount of slag. This slag mostly contains silicates and can be utilized in a construction industry. In addition to silicates it also contains Fe; if the Fe content is high, the density of the silicate phases increases and such a slag cannot be used as an additive for the concrete. Furthermore, slags obtained during copper matte production contain copper, sulphur, zinc and some other elements. Fe is the element with the highest price in these slags. An extraction of Fe is possible even using the conventional methods, e.g., the addition of slag to the charge materials during production of sinter for the blast furnace smelting. However, in this case, the blast furnace hot metal would accumulate sulphur and copper which is very harmful impurity for the steelmaking. An accumulation of copper by the blast furnace hot metal is unacceptable, as copper cannot be removed during further steelmaking operations having a critical effect on the properties of steel. In present work, the technological scheme for non-waste utilization of the copper smelting slags has been suggested and experimentally confirmed. This scheme includes a solid state reduction of Fe and smelting for the separation of cast iron and slag. During solid state reduction, the zinc vapor was trapped. After the reduction and smelting operations, the cast iron containing copper was used for the production of metal balls with increased mechanical properties allowing their utilization for milling of ore minerals. Such a cast iron could also be applied in the production of special types of steel with copper. The silicate slag freed from Fe might be used as a propping agent in the oil industry, or granulated for application as an additive for concrete in a construction industry. Thereby, the suggested products for a Mini Mill plant with non-waste utilization of the copper smelting slags are cast iron grinding balls for the ore minerals, special types of steel with copper, silicate slag utilized as an additive for the concrete and propping agents for the oil industry.

**Keywords :** utilization of copper slag, cast iron, grinding balls, propping agents

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