# HANDLING OF FINES DURING PYROMETALLURGICAL PROCESSES: CHALLENGES AND PROSPECTS

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## ABSTRACT

During the mining, handling, and processing activities, the production of fines is inevitable due to breakage of large particles caused by compression, abrasion, attrition and impact of the ore particles with one another and the equipment during beneficiation and handling. The fines generated as a result, are generally high-grade feed stock materials and add value to processes. Many attempts to recycle these fines have shown some limitations because of the quality of binders used for agglomeration. Pyrometallurgical processes are based on the principle of "look at the slag and the metal will look at it itself "to emphasise on the quality of the slag for better of metal recovery. Inorganic binders have proven to be impurities carriers therefore disturbing smelting processes due to poor slag composition. The current investigation deals with the impact of organic binders on copper slag briquettes used for copper recovery during carbothermic reduction. It transpired that organic binders have shown improvement on the behaviour of the copper slag briquettes during carbothermic reduction in the furnace. XRF, XRD and SEM-EDS have been used to characterise the head samples and products.

**Keywords:** Fines, binders, briquettes

## INTRODUCTION

The value chain of metal production is summarized in different steps namely mining, ores treatment through different routes to produce either a material or metal of certain purity. During excavation operations fines are generally generated. However, depending on the type of ore mined and the chemical composition of the ore the amount may vary based on the mechanical properties of high level of minerals present in the ores. During crushing and grinding which constitute comminution, particle size reduction and minerals liberation occur [1]. While it is largely reported on fine generation during comminution, it is observed that even during high temperature operations fine are generated due different phenomena [2-7]. The proceeds of smelting are namely the metal, slag and off-gases. Depending on the process and the grade the slag may either be recycled or stockpiled. During handling of slag fine are also generated, which makes the recycling of slag challenging and causing a loss to the production. Valuable fines are therefore agglomerated using different ingredients amongst which binders. Inorganic binders have been largely used to valorise fines that are recycled in the value chain and increase the production. Not only that fines are contributing to production, but also due to gradual depletion of the ore bodies lumps fines have become a secondary source of