

Preparation of glass fibers from copper slag

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Abstract

The presented study aims to prepare chemical resistant glass fibers out of fayalitic copper slag. By carbothermic reduction (CRT) the glass within the system $\text{SiO}_2\text{-CaO-Al}_2\text{O}_3$ will be prepared with an iron oxide content as low as possible.

A primary copper slag (PCS) is used as an input material which is characterized by X Ray Fluorescence (XRF). After reduction by CRT a pig iron phase, which can be used in the steel industry [1], and a secondary copper slag (SCS) phase, which is used to prepare chemical resistant glass fibers, are generated. The CRT is carried out in a graphite crucible within an induction furnace by mixing the PCS with petrol coke as a reducing agent and CaCO_3 as fluxing agent. In Figure 1 the generated materials are depicted. The iron content within the SCS can be reduced down to 1.17 wt% (as $\text{Fe}_2\text{O}_3 + \text{FeO}$). The glass fibers are drawn manually from re-molten SCS, characterized by light microscopy, XRD and SEM-EDX as well as alkali resistance tests.

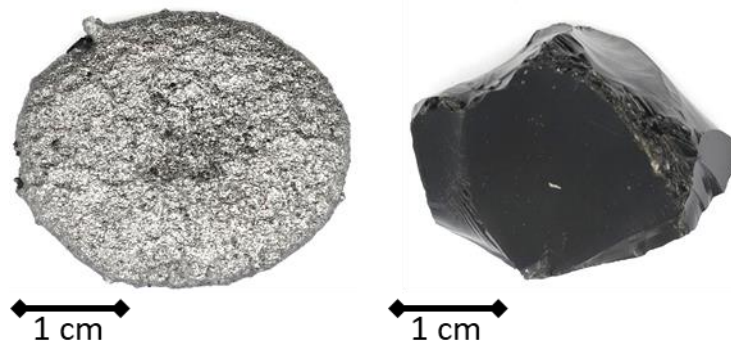


Fig. 1: Pig Iron phase (PIP, left) and amorphous Secondary Copper Slag (SCS, right).

References:

[1] Blenau L, Stelter M, Charitos A. Carbothermic reduction of fayalitic slag with graphite – understanding reaction kinetics for pig iron production. In Slag valorisation symposium 7 conference proceedings; 2021.