Flowsheets That Can Turn BR Into Building Materials And Save CO_2

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Abstract

Within the EU-funded ReActiv project (GA No. 958208), significant efforts have been undertaken to convert bauxite residue BR into valuable building materials for the construction industry. In this study, the environmental implications of different BR conversion projects, focusing on Co-Calcined BR, Vitrified BR and iron-free BR slag by smelting were investigated. The CO_2 emissions per ton of product for each processing route were estimated. Additionally, to provide a basis for comparison, the current CO_2 emissions associated with the production of 100% cement clinker, which serves as the conventional material in the cement industry is presented.

The advantage of this approach is that the BR contains only a very low content of chemically-fixed carbonates that will be released during its thermal treatment procedure, as is the case with limestone during the clinker production process. Consequently, each mt of standard clinker that can be replaced by a ReActiv SCM (Supplementary Cementitious Material) has the potential of a direct reduction of the overall CO_2 footprint in the cement industry.

The paper in hand shows flowsheet concepts for the three BR processing technologies and discusses mass and energy requirements. It also shows the available state-of-the-art equipment such as multiple hearth furnaces, rotary kilns, submerged arc furnaces and treatable mass streams.

An indicative SWOT analysis for each technology together with a business concept summary will finalize this work. The aim is also to show a possible path in how two or even three currently

parallel-acting industrial sectors, i.e., alumina, cement and steel could reduce their overall environmental footprint through smart cooperation.

Keywords: Valorization of bauxite residues, flow sheet, cement substitute, cementitious SCM, pig iron coproduction, industrial symbiosis.