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Recycling Bayer and sintering red muds in brick production: a review

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Key words: Bauxite residue; Red mud (RM); Firing brick; Cementing brick; Geopolymer brick; Construction materials

Bayer and sintering red muds

In Bayer red mud (BRM), Fe_2O_3 and Al_2O_3 are the major components, so it has a high alkaline contentand, and its particle size falls within the range of 3–10 μm.

For sintering red mud (SRM), SiO_2 and CaO are the major oxides. This is why SRM is dull grey in colour, while BRM is usually dark red.

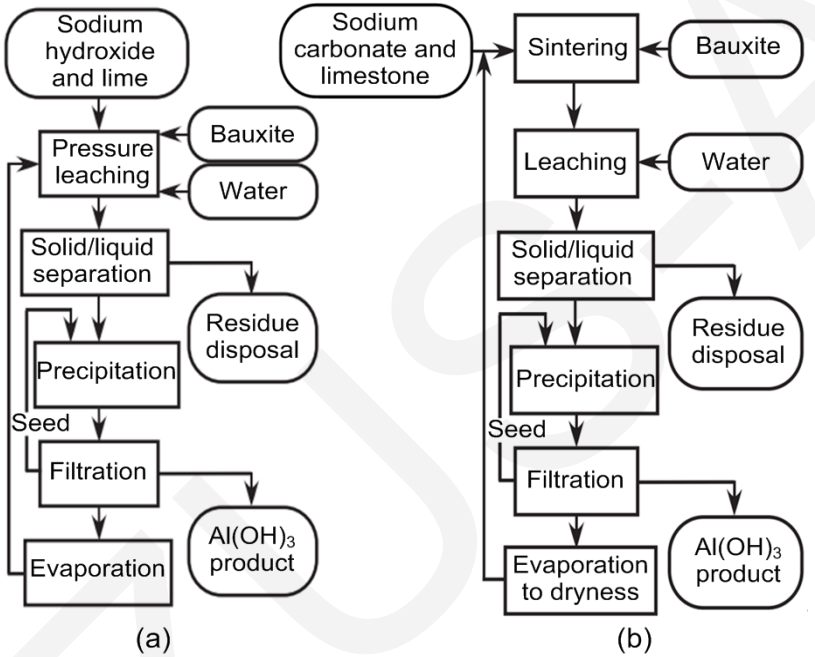

Fig. 1 Production processes of alumina: (a) Bayer process; (b) sintering process.

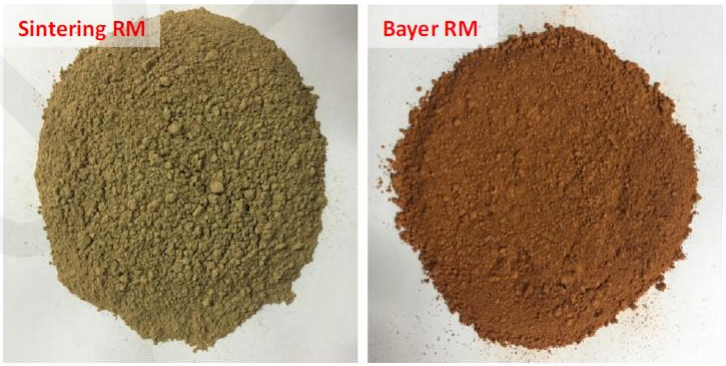

Fig. 2 Morphology of RM produced from sintering and Bayer processes.

Due to $CaCO_3$ and SiO_2 precipitation and crystallization during the sintering process, the particle size of SRM usually falls within the range of 1–20 μm, which is expected to be larger than that of BRM.

SRM presented cementitious activity due to its higher CaO content and abundant C_2S phase.

Brick production by BRM and SRM

The effects of different RMs on the pro-duction of bricks by different methods of firing, cementing, and geopolymerization are discussed:

High alkaline-based BRM is particularly useful as a raw material to produce fired brick and geopolymer brick.

SRM, which contains more dicalcium silicate (C_2S) and some cementitious phases, can be favorably used to produce cementing brick.

RM geopolymer brick normally has more strength (up to 51 MPa) than fired and cementing bricks, and good durability (no efflorescence) with low energy consumption and CO_2 emissions.