

CAI – ALON

Alumina for Calcium Aluminates

Calcium aluminates are significant mineral constituents of

- Portland cement and calcium sulfoaluminate cement (both used in the building industry)
- calcium aluminate cements (for construction and refractory applications)
- calcium aluminate fluxing agents (used in the steel industry).

Portland cement typically contains 4-6 % Al₂O₃, in the form of the clinker phases 3CaO·Al₂O₃ and 4CaO·Al₂O₃·Fe₂O₃. Calcium sulfoaluminate cement, with about 25-40 % Al₂O₃, is based on 3CaO·3Al₂O₃·CaSO₄. Calcium aluminate cements are produced with contents of 40-80 % Al₂O₃, containing as main active the clinker phase CaO·Al₂O₃. Fluxing agents for steel contain about 50-55% Al₂O₃ and are based on 12CaO·7Al₂O₃. The traditional alumina source in the production of calcium aluminates is natural bauxite.

A cost-effective substitute for bauxite is CAI-ALON, providing about 83 % Al₂O₃, on a calcined basis. The mineral components are corundum (alpha-Al₂O₃), spinel (MgO·Al₂O₃), aluminium nitride (AlN), metallic aluminium (Al), quartz (SiO₂) and small quantities of fluoride and chloride (CaF₂, NaCl). CAI-ALON is a dry powder with a particle size of 95 % less than 0.3 mm.

CAI-ALON is produced by processing slag (dross) from melting aluminium metal. The advantages of using processed aluminium slag materials in the production of calcium aluminates are:

- faster sintering and smelting (due to the fine particle size)
- less energy for sintering and smelting (Al and AlN are exothermically converted to Al₂O₃),
- reduced temperature of sintering and smelting (due to the contents of CaF₂ and NaCl),
- early setting of the cement (fluoride is incorporated in the clinker as 11CaO·7Al₂O₃·CaF₂).

Literature

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