CAI – ALON

Alumina for Mineral Fibres

The addition of alumina into the manufacture of mineral fibres (mineral wool, rock wool, stone wool) is a direct result of concerns over the bio-solubility of mineral fibres, their ability to be dissolved into the human blood system. Basically it was found that the higher the alumina content of mineral fibres, the more easily they were able to dissolve in blood, i.e. they have a low biopersistence. *[1]*
The typical chemical composition of mineral fibres with low biopersistence ranges 38-46% SiO_2, 15-38% CaO, 10-32% Al_2O_3, 2-10% MgO, 0.5-3% TiO_2, 0.3-7% FeO, 0.3-3% Na_2O, 0.3-1.3% K_2O. *[2]*

The aim of mineral wool manufacturers is to use in the raw material mix as high alumina content basalt and anorthosite as possible. If there is a need for additional alumina in the mixture, the obvious choice for an alumina source is bauxite.

A cost-effective substitute for bauxite is CAI-ALON, providing about 83 % Al_2O_3, on a calcined basis. The mineral components are corundum (alpha-Al_2O_3), spinel ($MgO.Al_2O_3$), aluminium nitride (AlN), metallic aluminium (Al), quartz (SiO_2) and small quantities of fluorides and chlorides (CaF_2, 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 advantageous use of processed aluminium slag materials in the production of mineral fibres is already state of technology since about 20 years *[3-4]*:

- faster smelting (due to the fine particle size),
- less energy for smelting (Al and AlN are exothermically converted to Al_2O_3),
- reduced smelting temperature, viscosity and surface tension (due to CaF_2 and NaCl).

In the production of mineral wool the feed for the shaft furnace typically used are lumps in the size of about 10-20 cm or briquettes of recycled fibre material, mixed with fine grained materials (fly ash, blast furnace slag, and cement as binder). Processed aluminium slag powder can be added to the mixture of the briquettes or even directly injected into the melt. *[5-6]*

Literature

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[4] WO 99/28253: Production of man-made vitreous fibres. ROCKWOOL INTERNATIONAL A/S, Denmark. Priority data: 2 December 1997
[5] WO 99/28252: Briquettes for mineral fibre production and their use. ROCKWOOL INTERNATIONAL A/S, Denmark. Priority data: 2 December 1997
[6] WO 99/28249: Apparatus and method for the production of man-made vitreous fibres. ROCKWOOL INTERNATIONAL A/S, Denmark. Priority data: 2 December 1997

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