

# Feldspar

## What is Feldspar ?

*Feldspar is by far the most abundant group of minerals in the earth's crust, forming about 60% of terrestrial rocks. Most European deposits offer potassium feldspar as well as sodium feldspar and mixed feldspars. Feldspars are primarily used in industrial applications for their alumina and alkali content. The term feldspar encompasses a whole range of materials. Most of the products we use on a daily basis are made with feldspar: glass for drinking, glass for protection, glass wool for insulation, the floor tiles and shower basin in our bathroom, the tableware from which we eat, ... Feldspar is part of our daily life.*

Feldspar minerals are essential components in igneous, metamorphic and sedimentary rocks, to such an extent that the classification of a number of rocks is based on feldspar content. The mineralogical composition of most feldspars can be expressed in terms of the ternary system Orthoclase ( $\text{KAlSi}_3\text{O}_8$ ), Albite ( $\text{NaAlSi}_3\text{O}_8$ ) and Anorthite ( $\text{CaAl}_2\text{Si}_2\text{O}_8$ ). Chemically, the feldspars are silicates of aluminium, containing sodium, potassium, iron, calcium, or barium or combinations of these elements.

The minerals of which the composition is comprised between Albite and Anorthite are known as the **plagioclase feldspars**, while those comprised between Albite and Orthoclase are called the **alkali feldspars**. The latter category is of particular interest in terms of industrial use of feldspars.

Amongst the numerous rocks in which they are present, feldspars are particularly abundant in igneous rocks like granite, which contains up to 50 or 70% of alkaline feldspar. Granite is however rarely used for its feldspathic content. Rather a whole range of rocks geologically connected to granite is used. Most often, commercial feldspar is mined from pegmatite or feldspathic sand deposits. Aplite, which is



a fine-grained igneous rock with the same mineralogical composition as granite is also frequently mined for its feldspar content.

Basically, the two properties which make feldspars useful for downstream industries are their alkali and alumina content. On those elements we can distinguish three families: Feldspathic sand, Pegmatite and Feldspar.

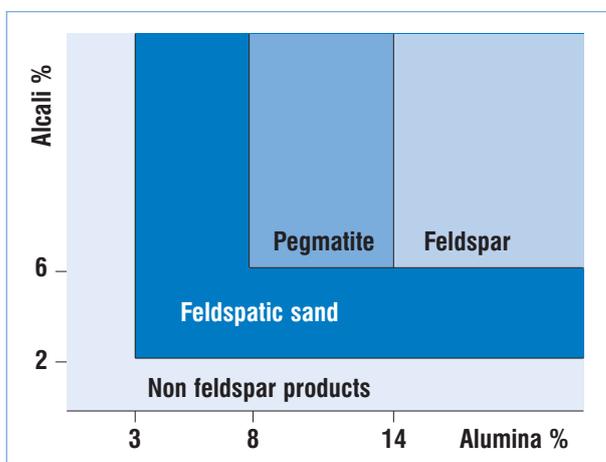
A further distinction can be made between sodium, potassium and mixed feldspars, depending on the type of alkali they contain.

## Multiple properties – manifold uses

Feldspars play an important role as fluxing agents in ceramics and glass applications, and are also used as functional fillers in the paint, plastic, rubber and adhesive industries.

● **Ceramics:** In the manufacture of ceramics, feldspar is the second most important ingredient after clay.

Since feldspar does not have a strict melting point it melts gradually over a range of temperatures. This greatly facilitates the melting of quartz and clays and, through appropriate mixing, allows to modulate this important step of ceramic making. Feldspars are used as fluxing agents, to form a glassy phase at low temperatures, and as a source of alkalis and alumina in glazes. They improve the strength, toughness, and durability of the ceramic body and cement the crystalline phase of other ingredients, softening, melting and wetting other batch constituents.



## Industrial Minerals

Your world is made of them

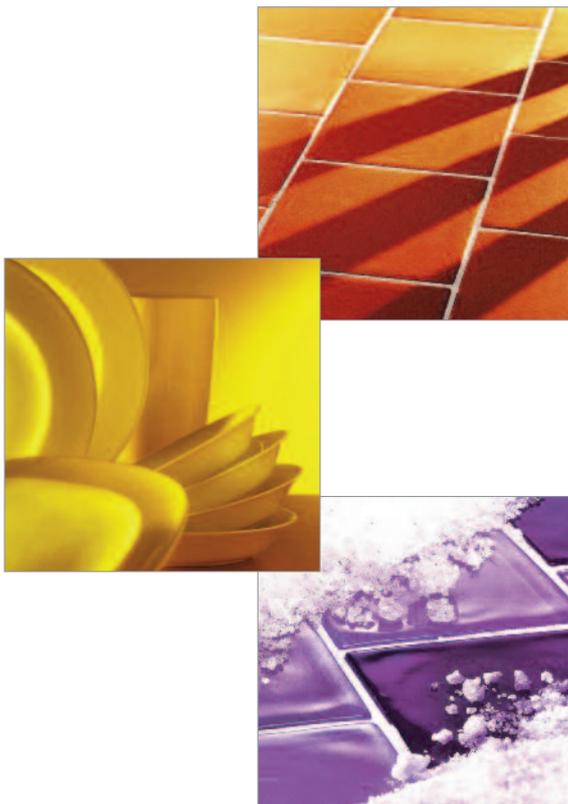


In the **flooring sector**, feldspar is the main constituent in the body composition. It is used as a flux, lowering the vitrifying temperature of a ceramic body during firing and forming a glassy phase. Surface tension pull the remaining solid particles together, giving a densification of the ceramic body. With rising temperature the alkalis become more active and first dissolve the clay particles and then the free silica.

In **tableware**, feldspar gives a good fusibility for a product without defects.

In the **sanitaryware** sector, the use of feldspar within vitreous ceramic bodies is used here to illustrate this optimisation process.

- **Glass:** Feldspar is an important ingredient in the manufacture of glass and an important raw material as well, because it acts as a fluxing agent, reducing the melting temperature of quartz and helping to control the viscosity of glass. The alkali content in feldspar acts as flux, lowering the glass batch melting temperature and thus reducing production costs. But feldspars are



primarily added to glass batches for their alumina content, which improve hardness, durability, and resistance to chemical corrosion. The raw material for glass consists of silica sand, soda ash (sodium carbonate) and limestone (calcium carbonate).

Feldspar adds certain qualities to the process. Alumina provides hardness, workability, and strength, and makes glass more resistant to chemicals and more suitable for pressing. Fluxes reduce the melting temperature so that less energy is used and decrease the amount of soda ash needed.

Feldspars are used in the production of flat glass (windows, car glass...) but also container glass. They provide us with a clear view for our television and computer screens, car headlamps, fluorescent tubes, perfume bottles, soda bottles, pharmaceutical or laboratory glass...

- **Fillers:** Feldspars are also used as fillers and extenders in applications such as paints, plastics and rubber. Beneficial properties of feldspars include good dispersability, chemical inertness, stable pH, high resistance to abrasion, low viscosity at high filler loading, interesting refractive index and resistance to frosting. The products used in such applications are generally fine-milled grades.
- **Enamel frits and glazes:** Feldspar enters in the enamel composition, assuring the absence of defects and the neatness of the end product: enamel frits, ceramic glazes, ceramic tile glazes, sanitaryware, tableware, electrical porcelain and giftware to name just a few.
- **And many other end-uses:** in paint, in mild abrasives, urethane, welding electrodes (production of steel), latex foam, as a welding rod coating, road aggregate...

For more information, please contact:

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