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Kaolin ($Al_4(OH)_8[Si_4O_{10}]$)...

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Characteristics / Function:

Kaolin (china clay) is a potash-alum-silicate, containing the **mineral kaolinite $Al_4(OH)_8[Si_4O_{10}]$** as a main substance. It is a result of the **deterioration** and **transformation** of silicate containing minerals. Pure kaolin is snow white, mixed with quartz and feldspar it can be drab (raw kaolin, kaolin sand).

In many countries, Kaolin can be found as a final product of the deterioration of granite and feldspar. The demanded purity, however, is rather rare. The components of kaolin are primary and secondary kaolinites. The percentage between length and thickness concerning the flake structure is 10 : 1 (primary kaolinites). The flakes are **hexagonally crystal-shaped**.

The disintegration is necessary to purify the product and to attain a higher whiteness. It is mined by flotation or wet chemical methods, followed by straining and a centrifugal separation of coarse and fine particles.

Properties:

Kaolin is a mostly monoclinic crystal-system potash- alum- silicate. The formation of plate-like, hexagonal discs is based in the above mentioned.

Chemical components:

SiO_2	46 to 49 %
Al_2O_3	35 %
MgO	0.2 %
Na_2O	0.07 %
Density	2.6 g/cm^3
Specific surface	at 8.33 m^2/g

Kaolin has **no electrical conductibility**, the **whiteness is very high**; it is very chemical resistant, even against strong acids. The pH-value of hard-kaolin is 5.0 - 5.6.

Application for paints and varnishes:

Kaolin is not only an **inert filling** for paints and varnishes. It also gives them **special advantageous properties**. The **particle shape** and the **charge distribution** have an influence on the **rheological properties**; the attainable **thixotropy** prevents the **settling of particles** and the **stratified structure** serves for **positive mechanical values**, a high **reflecting power** and **hiding power**. At the same time, the **surface hardness of the final product** is improved.

Application for plastics/rubber:

Kaolin is often applied in the **rubber** and **thermoplastics industry**. It helps to **improve the chemical resistance** and the **electrical conductibility**. Furthermore, it increases the **impact resistance** and the **surface quality**. On the other hand, it **reduces the water absorption and the tendency of cracking** of the final product.

Application for paper industry:

Kaolin is the **classical filling** and the **original pigment** for the paper industry. The **small size** of the **particles**, the **disc shape** and the **surface charge**, caused by the disturbances of the trellis, are responsible for special applications.

Kaolin is especially used for **wood containing LWC- and SC- papers**. It influences evenness, gloss and printability in a special way.

Calcinated kaolines:

A **supervised calcination** leads to **harder products** and a special **pore structure**. Applied with **cable insulations**, one can attain better qualities of the polymers.

The pore structure of calcinated kaolin implies an improved light scattering, a higher opacity and whiteness; that makes it a special filling.

Bibliography:

- Römpps Chemie-Lexikon

- H. Kittel; Lehrbuch der Lacke und Beschichtungen
- Geächter/Müller: Kunststoffadditive/3. Ausgabe
- Presentations at PTS-IPZ-Seminar Dresden 1993

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