

Definition: **clay** from *Philip's Encyclopedia*

Group of hydrous silicates of aluminium and magnesium, including kaolinite and halloysite, usually mixed with some quartz, calcite or gypsum. It is formed by the weathering of surface granite or the chemical decomposition of feldspar. Soft when wet, it hardens on firing and is used to make ceramics. It is also used for bricks and cement, as well as the manufacture of electrical insulators, pipes and paper.

Summary Article: **clay**

From *The Columbia Encyclopedia*

common name for a number of fine-grained, earthy materials that become plastic when wet.

Chemically, clays are hydrous aluminum silicates, ordinarily containing impurities, e.g., potassium, sodium, calcium, magnesium, or iron, in small amounts.

Properties and Classification

Properties of the clays include plasticity, shrinkage under firing and under air drying, fineness of grain, color after firing, hardness, cohesion, and capacity of the surface to take decoration. On the basis of such qualities clays are variously divided into classes or groups; products are generally made from mixtures of clays and other substances. The purest clays are the china clays and kaolins. "Ball clay" is a name for a group of plastic, refractory (high-temperature) clays used with other clays to improve their plasticity and to increase their strength. Bentonites are clays composed of very fine particles derived usually from volcanic ash. They are composed chiefly of the hydrous magnesium-calcium-aluminum silicate called montmorillonite. See also fuller's earth.

Individual clay particles are always smaller than 0.004 mm. Clays often form colloidal suspensions when immersed in water, but the clay particles flocculate (clump) and settle quickly in saline water. Clays are easily molded into a form that they retain when dry, and they become hard and lose their plasticity when subjected to heat.

Formation

Clays are divided into two classes: residual clay, found in the place of origin, and transported clay, also known as sedimentary clay, removed from the place of origin by an agent of erosion and deposited in a new and possibly distant position. Residual clays are most commonly formed by surface weathering, which gives rise to clay in three ways—by the chemical decomposition of rocks, such as granite, containing silica and alumina; by the solution of rocks, such as limestone, containing clayey impurities, which, being insoluble, are deposited as clay; and by the disintegration and solution of shale. One of the commonest processes of clay formation is the chemical decomposition of feldspar.

Clay consists of a sheet of interconnected silicates combined with a second sheetlike grouping of metallic atoms, oxygen, and hydroxyl, forming a two-layer mineral such as kaolinite. Sometimes the latter sheetlike structure is found sandwiched between two silica sheets, forming a three-layer mineral such as vermiculite. In the lithification process, compacted clay layers can be transformed into shale. Under the intense heat and pressure that may develop in the layers, the shale can be metamorphosed into slate.

Uses

From prehistoric times, clay has been indispensable in architecture, in industry, and in agriculture. As a building material, it is used in the form of brick, either sun-dried (adobe) or fired. Clays are also of great industrial importance, e.g., in the manufacture of tile for wall and floor coverings, of porcelain, china, and earthenware, and of pipe for drainage and sewage. Highly absorbent, bentonite is much used in foundry work for facing the molds and preparing the molding sands for casting metals. The less absorbent bentonites are used chiefly in the oil industry, e.g., as filtering and deodorizing agents in the refining of petroleum and, mixed with other materials, as drilling muds to protect the cutting bit while drilling. Other uses are in the making of fillers, sizings, and dressings in construction, in clarifying water and wine, in purifying sewage, and in the paper, ceramics, plastics, and rubber industries.

Clay as a Soil

Clay is one of the three principal types of soil, the other two being sand and loam. A certain amount of clay is a desirable constituent of soil, since it binds other kinds of particles together and makes the whole retentive of water. Excessively clayey soils, however, are exceedingly difficult to cultivate. Their stiffness presents resistance to implements, impedes the growth of the plants, and prevents free circulation of air around the roots. They are cold and sticky in wet weather, while in dry weather they bake hard and crack. Clods form very often in clayey soils. Clays can be improved by the addition of lime, chalk, or organic matter; sodium nitrate, however, intensifies the injurious effects. In spite of their disadvantages, the richness of clay soils makes them favorable to the growth of crops that have been started in other soil.

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