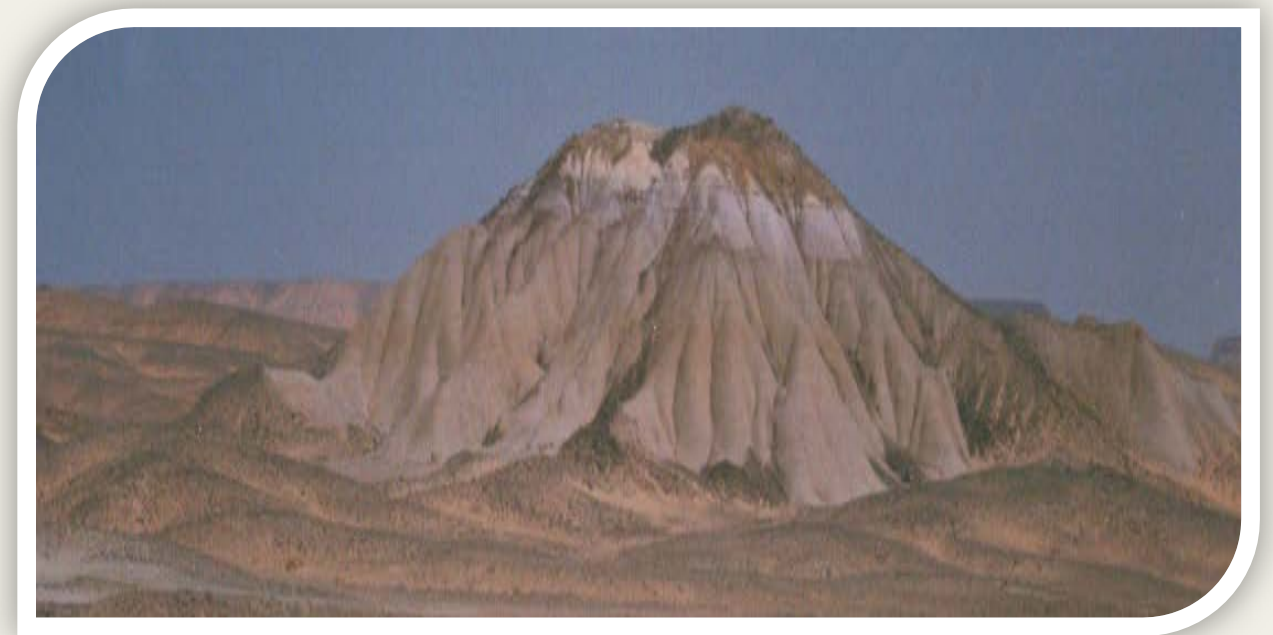




*Kaolin*



## **Kaolin**

Kaolin, or China clay, is nearly white in color. It is distinguished from other industrial clays based on its fine particle size and pure coloring. Its ability to disperse in water make it an ideal pigment. Kaolin is derived from the mineral Kaolinite which comes from the Earth's crust. It is an aluminum silicate represented as  $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$ .

The primary constituent in kaolin is the mineral kaolinite, a hydrous aluminum silicate formed by the decomposition of minerals such as feldspar.

## **Industrial Applications**

Kaolin is used in a multiplicity of industries because of unique physical and chemical properties. Shape, particle size, color, softness, and non-abrasiveness are physical properties that are especially important. Chemical properties, such as comparatively low base exchange capacity, as well as other chemical properties of the kaolin surface, and relative insolubility, are governing in many uses.

**Paper Industry:** The primary use of kaolin is in the paper industry. It serves as a paper coating which improves appearance by contributing to brightness, smoothness and gloss. It also improves printability. Additionally, it is used by the paper industry as a filler reducing cost and the use of tree-based resources.

The largest single user of kaolin is the paper industry because when kaolin is used, paper products print better and are made whiter and smoother. Kaolin used as a filler in the interstices of the sheet adds ink receptivity and opacity to the paper sheet. Kaolin used to coat the surface of the paper sheet makes possible sharp photographic illustrations and bright printed colors. Kaolin constitutes nearly one-third the weight of today's slick sheet magazines.

## **Ceramic Industry:**

Kaolin is used in ceramic whiteware products, insulators, and refractories. In whitewares, kaolin aids accurate control of molding properties, and adds dry and fired strength, dimensional stability, and a smooth surface finish to the ware. The excellent dielectric properties and chemical inertness of kaolin make it well suited

for porcelain electrical insulators. In refractory applications, the dimensional stability, high fusion point, and low water content, along with high green strength, make kaolin an important constituent.

### **Paint Industries**

Kaolin is used in paint industry because it is chemically inert and insoluble in the paint system, has a high covering power, gives the paint desirable flow properties and is low in cost.

### **Rubber Industries**

Kaolin is used as a filler in many rubber goods. It adds strength, abrasion resistance, and rigidity to both natural and synthetic rubber products. In general, most rubber products extrude more easily after kaolin filler is added. The major reason that kaolin is used in rubber compounds is its whiteness and low cost. Although kaolin costs less than most other rubber pigments, it has excellent functional properties.

**Other Uses:** Kaolin has a variety of other uses in products including cable insulation, specialty films and fertilizers, glass fiber, white cement and refractory insulation bricks.. New uses are being discovered frequently, and ensure that the mineral will remain in demand for a long time.



## Kaolin in Jordan

Kaolin is white, soft, plastic clay mainly composed of the fine-grained platy mineral kaolinite; a white hydrous aluminum silicate,  $\text{Al}_2\text{Si}_2\text{O}_5 (\text{OH})_4$ , containing 23.5% alumina, 46.5% silica, and 14% water.

It is used in the manufacturing of white-ware ceramics and in filling and coating of paper. It is also used as filler in paints, rubber, plastics and many other productions.



## Geological Setting

Kaolin deposits are exposed in four main localities in south Jordan; Batn El-Ghul, Al Mudawwara, Al-Hiswa and Umm Sahn areas. Both Batn El-Ghul and Hiswa have been exploited in few quantities. Kaolin is still not exploited in Mudawwara and Umm Sahn areas. The four deposits are of Ordovician age. Locally, both Batn El-Ghul and Al-Mudawwara deposits belong to Batra Mudstone Member of Mudawwara Formation and Al-Hiswa deposit belongs to Al-Hiswa Sandstone Formation.

## Location and Reserve

Area	Location	Reserve (mt)
Batn El-Ghul	70km SE of Ma'an about 280 km south of Amman	1100
Al Mudawwara	120 km SE of Ma'an, about 10 km east of Al-Mudawwara police station	9700
Al Hiswa	45 km east of Al-Quwayra town, close to Al-Hiswa railway station	54
Um Sahn	40 km southeast of Ad Disa town	1090

## Chemical properties

Area	Al <sub>2</sub> O <sub>3</sub> %		SiO <sub>2</sub> %		Fe <sub>2</sub> O <sub>3</sub> %	
	max.	min.	max.	min.	max.	min.
Batn El Ghul	25.37	14.01	68.32	47.79	8.37	4.05
Al-Mudawwara	27.54	13.36	70.20	41.87	10.54	4.54
Al-Hiswa	29.27	12.94	78.88	49.04	9.09	1.15
Dubaydib/Um Sahn	24.70	17.0	61.97	49.04	11.04	3.5



## Investment Opportunities

- ❖ Investment is open in areas, which have huge reserves of kaolin as Batn El Ghul, Mudawwara and Dubaydib/Umm Sahn areas.
- ❖ Jordan is one of the less well-known ceramics manufacturing bases in the Middle East. However, the kaolin producers have enhanced their position on the global stage due to a steadily expanding domestic market and a program of product improvement.

- ❖ Cement industry is one of the most important factors in the Jordanian mining sector. Thus, it depends solely on the domestic natural minerals as raw materials such as kaolin. There is a rapid growth in local cement market due to the increase of construction industry in Jordan and neighboring countries.
  
- ❖ Artistic Ceramic Ware: It is worth mentioning that in Jordan today there are many shops producing artistic ware such as simple vases, statues, murals and oriental dishes, many of which are decorated with holy pictures. There is also a growing demand for these items by the increasing amount of tourists that are flocking to the country.  
 Virtually all of these artistic ware suppliers are small-scale concerns and as such depend heavily on the country's large factories to assist with the processing of their raw materials and supply of glazes and other decorative materials. To date this system has been working well, but the increasing prevalence of cut-price ornamental ware from China is just starting to have an effect on the viability of some of these smallest craft shops.
  
- ❖ Tableware and Kitchenware: This industry nearly does not exist. It is restricted to what manufactured with artistic ware.
  
- ❖ Stoneware (Pipes and Tiles): The usability phase of Geo industria technological work (2000) resulted in verification of the suitability of Batn el Ghoul deposit sequence as ceramic clay for production of the stoneware assortment, i.e. stoneware pipes, and stoneware floor tiles namely. Two qualitative clay types are present in Batn el Ghoul, with low Fe<sub>2</sub>O<sub>3</sub> content (white clay stone) and high Fe<sub>2</sub>O<sub>3</sub> content (mottled clay stone). The white clay stone can be easily separated by means of hand sorting of bulks and fragments of the mined clay stone mottled layer. Because of the light colored and non-vitreous body after burning, white clays are classified as ceramic clay suitable for alumina white ware production. The red colored portion of the clay stone mottled layer remains in quality of the raw material suitable for the stoneware production.

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