

### 6.1.7. **Kaolin**

Kaolin or China clay is almost white in colour. It is different from other industrial clays in terms of its fine particle size and pure colouring. Since it can be dispersed in water, it is considered an ideal pigment.

#### **Synonyms**

China clay, paper clay, and white clay.

#### **Source**

Kaolin is a **group of hydrous aluminium silicates**, among which **kaolinite** is the major mineral. Kaolinite is widely found across the earth's surface as a **major component of soils in humid sub-tropical and tropical areas**. Kaolin deposits of sufficient purity, brightness, whiteness, and suitable mineral-water slurry viscosity, are rare.

Kaolin deposits can occur by the following ways:

- 1) **Sedimentary bodies** with moderate to very low grit content in various stages of oxidation and re-crystallisation.
- 2) **Residual weathering blankets** or funnel-shaped hydrothermal alteration zones along fracture patterns from much older aluminous rocks (such as granites).

#### **Occurrence and Distribution**

Kaolin is mined in Pakistan, Vietnam, Brazil, France, United Kingdom, Iran, Germany, India, Australia, Korea, China, the Czech Republic, Spain, and the United States America.

**Organoleptic Evaluation**

- 1) **Colour:** White, sometimes red, blue or brown tints from impurities.
- 2) **Crystal habit:** Earthy.
- 3) **Crystal system:** Triclinic.
- 4) **Fracture:** Perfect.
- 5) **Lustre:** Dull and earthy.
- 6) **Streak:** White.

Kaolin present in most of the commercial products contains particles of equivalent **spherical diameter** finer than  $2\mu\text{m}$ . Some other grades of kaolin products contain particles of  $10\mu\text{m}$  in size. **Hydrous kaolin** is **processed kaolin** containing kaolin minerals with their structural water or hydroxide component. **Calcined kaolin** is **thermally processed** by exposing it to temperatures higher than  $450^\circ\text{C}$  to form **metakaolin**, or to temperatures higher than  $1,000^\circ\text{C}$  to form **mullite**, **spinel**, and **cristobalite** (high temperature minerals).

Various types of kaolinitic rock contain **crude kaolin** ore deposits. **Primary kaolin** is a kaolin ore altered from an igneous or metamorphic rock previously kaolinised *in situ* by hydrothermal or weathering processes. **China-clay rock** and **residual kaolin** are some varieties of primary kaolin.

**Saprolite** is residual kaolin formed by the weathering of felsic igneous and metamorphic rocks. Sedimentary kaolin is a kaolin ore formed by the sedimentary depositional processes.

**Secondary kaolin** is sedimentary kaolin containing transported mineral particles. Though the term sedimentary kaolin was earlier used synonymously with secondary kaolin, it is clear that kaolin ores deposited as sediments have gone through post-depositional kaolinisation of other minerals or recrystallisation of kaolin minerals. The primary or sedimentary origin of a kaolin deposit influences the exploration, mining, and processing methods used for manufacturing a kaolin product.

**Chemical Constituents**

Kaolin is **anhydrous aluminium silicate** ( $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$  or  $\text{H}_4\text{Al}_2\text{Si}_2\text{O}_9$ ). It contains **silicon dioxide** (56.91%), **iron oxide** (0.93%), **titanium dioxide** (0.54%), **aluminium oxide** (39.68%), **calcium oxide** (0.16%), **magnesium oxide** (0.16%), **sodium oxide** (0.60%), **potassium oxide** (0.60%), and **water** (12.6%).

**Chemical Test**

On heating kaolin along with cobalt nitrate on charcoal black, a blue mass is formed due to alumina.

**Therapeutic Efficacy**

- 1) It is used in mild to moderate diarrhoea, severe diarrhoea (dysentery), and cholera.
- 2) It is used in combination with other products to treat diarrhoea and to relieve soreness and swelling within the mouth occurred due to radiotherapy.
- 3) These combination products are also used in the treatment of ulcers and chronic ulcerative colitis (inflammation in large intestine).
- 4) It is directly applied on the skin in the form of a wet dressing (poultice) or a dusting powder.
- 5) It is used for drying or softening the skin.
- 6) It is also used in laboratories for diagnosing diseases.
- 7) It used in tablet preparation, to filter materials, and to remove colour.

### 6.1.8. Pectin

Pectin is a complex component of carbohydrate found naturally in the middle lamella of plant cells. Chemically, it is a neutral methoxy ester of pectic acid. These polysaccharides function along with cellulose and hemicellulose as an intercellular cementing substance.

#### Source

Pectin is a purified polysaccharide substance obtained from various plant sources such as inner peel of citrus fruits, apple, raw papaya, etc. Numbers of plants sources of pectin are mentioned in the **table 6.3**:

**Table 6.3: Sources of Pectin**

Common Names	Botanical Names	Families	Parts used and %
Lemon	<i>Citrus lemon</i>	Rutaceae	Peel (10-15%)
Orange	<i>Citrus aurantium</i>	Rutaceae	Peel (10-12%)
Apple	<i>Pyrus malus</i>	Rosaceae	Pomace (10-15%)
Papaya	<i>Carica papaya</i>	Caricaceae	Fruit pulp (~ 16%)
Sunflower heads	<i>Helianthus tuberosus</i>	Asteraceae	Heads (05.0%)
Guava	<i>Psidium guava</i>	Myrtaceae	Fruit pulp (0.24-0.65)
Carrot	<i>Daucus carota</i>	Apiaceae	Whole fruit (10.0%)
Mangoes	<i>Mangifera indica</i>	Anacardiaceae	Fruit pulp (56-66 %)

#### Occurrence and Distribution

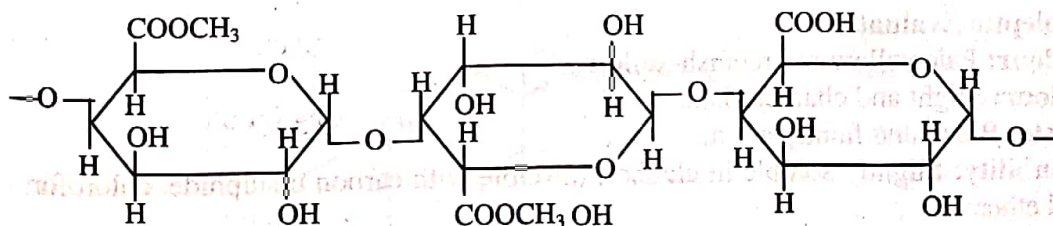
Lemon and oranges are mostly cultivated in India, Africa, and other tropical countries. Apple is grown in the Himalayas, California, many European countries, and the countries located in the Mediterranean climatic zone.

#### Organoleptic Evaluation

- 1) **Appearance:** Coarse or fine powder.
- 2) **Colour:** Yellowish white.
- 3) **Odour:** Odourless.
- 4) **Taste:** Mucilaginous.
- 5) **Nature:** Hygroscopic.
- 6) **Appearance:** Viscous, opalescent, colloidal, and mobile.
- 7) **Solubility:** Completely soluble in 20 parts of water and forms a solution containing negatively charged and very much hydrated particles, and dissolves more swiftly in water; insoluble in alcohol.

#### Chemical Constituents

Pectin occurs naturally as the partial methyl ester of  $\alpha(1\rightarrow4)$  linked (+) **polygalacturonate** sequences interrupted with (2)-(-)-**rhamnose** residues. The neutral sugars forming the side chains on pectin molecules are (+) galactose, (-)-arabinose, (+) xylose, and (-) fructose.



**Pectin Galacturonan**

**Chemical Tests**

- 1) On cooling 10% aqueous solution of pectin, it converts into a stiff gel.
- 2) 1ml 2% potassium hydroxide solution is added to 5ml 1% pectin solution, and the mixture is allowed to stand for 15 minutes at room temperature. A transparent or semi-gel is formed (distinction from tragacanth). This gel is acidified with dilute hydrochloric acid and shaken well. A voluminous, colourless, gelatinous precipitate is obtained which on boiling becomes white and flocculent.

**Therapeutic Efficacy**

- 1) It is a protectant having the property of colloidal absorption of toxins. This property enables the treatment of diarrhoea.
- 2) Its colloidal action also makes it act effectively in the gastrointestinal tract.
- 3) It is also used as haemostatic in internal and external haemorrhages.
- 4) It is an emulsifying agent, gelling agent, and a plasma substitute.

**6.1.9. Olive Oil**

Olive oil is a fat, obtained from the fruits of olive tree, which is a traditional tree crop of the Mediterranean region. The olives are collected and pressed in whole forms to yield the distinctive oil.

**Synonym**

Oleum Olivae.

**Source**

Olive oil is the fixed oil expressed from the ripe fruits of the tree *Olea europaea* Linn.

**Family**

Oleaceae

**Occurrence and Distribution**

Olive tree is indigenous to Palestine and to the nearby countries of Mediterranean Sea. It is grown in the United States and Southern Australia. Italy, Spain, and Greece are the leading countries producing olive oil. Other countries are Turkey, Tunisia, Morocco, and Syria.

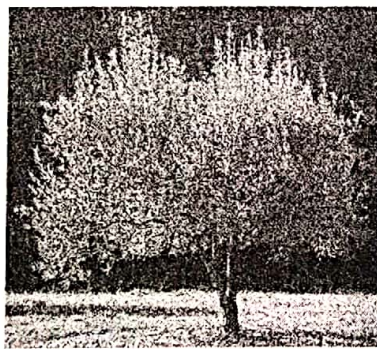


Figure 6.2: Olive Tree and Fruiting Twig

**Organoleptic Evaluation**

- 1) **Colour:** Pale yellow or greenish-yellow.
- 2) **Odour:** Slight and characteristic.
- 3) **Taste:** Bland and faintly acrid.
- 4) **Solubility:** Slightly soluble in alcohol; miscible with carbon disulphide, chloroform, and ether.

**Chemical Constituents**

Olive oil contains triglycerides in the form of **olein**, **palmitin**, and **linolein**.

**Chemical Tests**

- 1) It gives a deep golden-yellow colour when viewed under UV radiation.
- 2) The refined oil gives pale blue fluorescence under UV light. The fluorescence disappears when the oil is treated with charcoal.

**Therapeutic Efficacy**

- 1) It is externally applied over inflamed surfaces as an emollient and soothing agent.
- 2) It is used for softening the skin and crusts in eczema and psoriasis.
- 3) It is internally used as a nutrient, demulcent, and a mild laxative.
- 4) It is used as a vehicle for oily suspensions for injection.

**6.1.10. Lanolin**

The sebaceous glands of animals bearing wool secrete lanolin which is a wax. The form of lanolin used by humans is obtained from domestic sheep breeds raised to obtain their wool.

**Synonyms**

Wool fat, wool wax, wool grease, hydrous wool fat, Adeps Lanae, etc.

**Source**

Lanolin is a fat-like substance obtained from the secretion of sebaceous glands of the sheep *Ovis aries* Linn. These glands are deposited onto the wool fibres.

**Family**

Bovidae

**Occurrence and Distribution**

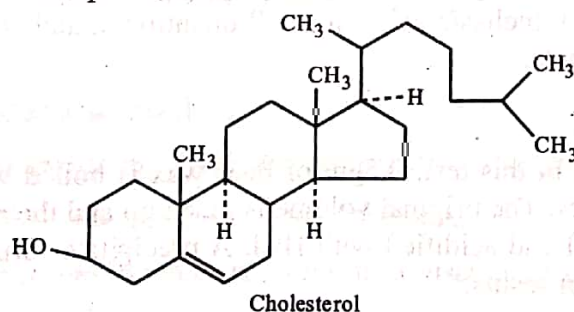
On a commercial scale, lanolin is manufactured in Australia, the U.S.A., and India (however, to a very less extent).

**Organoleptic Evaluation**

- 1) **Colour:** Whitish-yellow.
- 2) **Odour:** Faint and characteristic.
- 3) **Taste:** Bland.
- 4) **Extra Features:** Found in the form of ointment like mass; it separates into two layers when heated on a water bath.
- 5) **Solubility:** Practically insoluble in water; soluble in chloroform and solvent ether with separation of water.

**Chemical Constituents**

The esters and polyesters of 33 alcohols (of high molecular weight) and 36 fatty acids together make up a complex mixture of lanolin.



Lanolin contains **esters of cholesterol** and **ischolesterol** with carnaubic, oleic, myristic, palmitic, lignoceric, and lanopalmitic acids. It also contains 50% of water.

#### **Chemical Test**

Around 0.5gm of hydrous lanolin is dissolved in chloroform. To the resultant mixture, 1ml of acetic anhydride and 2 drops of sulphuric acid are added. A deep green colour develops due to the presence of cholesterol.

#### **Therapeutic Efficacy**

- 1) It is applied topically for treating or preventing dry skin, itching, or other skin irritation caused by diaper rash, radiation therapy skin burns, etc.
- 2) It is also used for treating sore and cracked nipples caused by breast-feeding. 