



# GOVERNMENT OF ANDHRA PRADESH COMMISSIONERATE OF COLLEGIATE EDUCATION



## Pigments Chemistry

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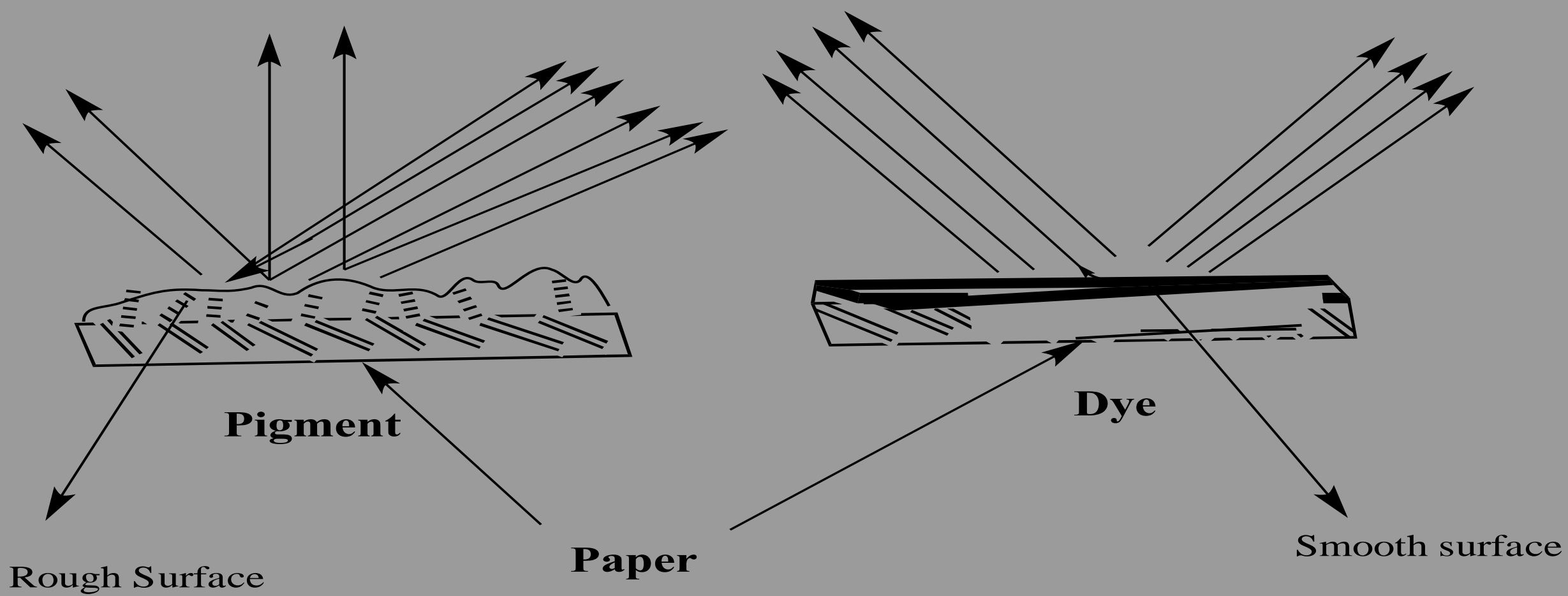
# Introduction

The word 'pigment' derives from the Latin **pigmentum** and originally denoted a colour in the sense of colouring matter (pingere, to paint). In the middle ages, the term "pigment" was also used for colored plant extracts. Pigments are various organic and inorganic insoluble substances, which are widely used as surface coatings. They are also employed in the ink, plastic, rubber, ceramic, and paper industries to impart colour. The pigment industry is usually regarded as associated with paints, but in fact it is a separate industry. A large number of pigments are mined or manufactured for the commercial preparation of paints. About 45 year back, white lead [ $2\text{Pb CO}_3 + \text{Pb (OH)}_2$ ], Zinc oxide (ZnO) and lithopone ( $\text{ZnS} + \text{BaSO}_4$ ) were the principal white pigments in use while the coloured pigments consisted of Prussian blue, lead chromates, various iron oxides and a few lake colours.

## Difference between Dyes and Pigments:

Dyes and pigments are substances that impart color to a material. The term colorant is often used for both dyes (also called dyestuffs) and pigments. Both dyes and pigments are powerful colorants. The major difference between the both is in terms of their solubility. The **reason** is that **dye** molecules are very small whereas pigments are much larger. Therefore, dyes **easily** dissolve in water and many solvents while pigments do not dissolve in water. Pigments can be dissolved in a liquid with the help of a binder while a dye can dissolve by itself.

**LIGHT**



**Light reflection off print surface**

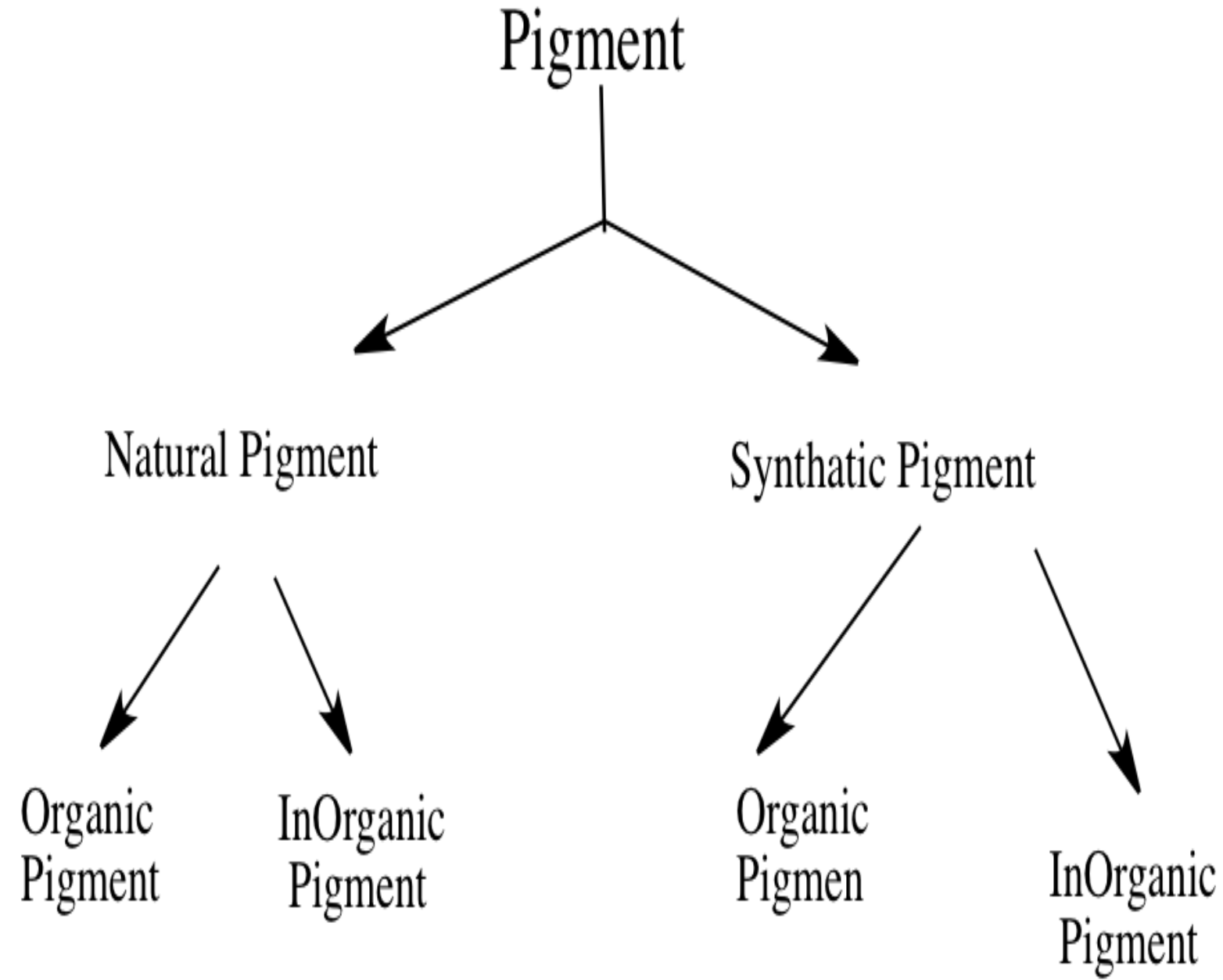
<b>Properties</b>	<b>Pigment</b>	<b>Dye</b>
Physical state	A pigment is an insoluble material ground into a fine powder used as a colorant.	A dye is a type of small soluble colorant.
Size	A pigment is comparatively large.	A dye particle is very small
Transparency	Pigments are comparatively less transparent.	Dyes are more transparent
Solubility	Pigments are not soluble in water and many solvents.	Dyes are soluble in water
Type of Compounds	Pigments can be either organic or inorganic.	Most dyes are organic
Auxochrome Groups	No auxochrome groups are present in pigments.	Auxochrome groups can be present in dyes
Availability	Pigments are less available.	Dyes are available in a large number
Affinity with material	Pigments have no direct affinity to the material.	Dyes have a direct affinity to the material
Binding Agents	Pigments require binding agents. Hence, this is another difference between dye and pigment.	Dyes do not require binding agents
Diffusion	Pigments diffuse on the fabric. Example: Indigo, Copper phthalocyanine etc.	Dyes diffuse in the fabric Example: Tartrazine, Alizarin, Eosin etc.

## PROPERTIES OF AN IDEAL PIGMENT:

Some properties that make for a good pigment are:

1. Maximum covering power
2. Minimum size of particles ranging from 0.2-0.4
3. Power to mix freely
4. Good chemical resistance
5. Acceptable levels of hardness, brilliance and stability on printed and dyed goods
6. Good resistance to light, wetness and abrasion
7. Chemical inertness
8. Excellent dispersion

# Types of Pigment





There are two types of Pigment. They are-

- 1. Natural pigment.
- 2. Synthetic pigment.
- **1. Natural pigments:** Natural pigments are naturally occurring colored substances obtained from plant or mineral compounds. They can be mixed with oil, water, or any other liquid to create coloring products such as paint.
- **2. Synthetic pigments:** Synthetic pigments are produced by thermal and/or chemical reaction between several materials



## Natural pigments are divided by two types.

- 1. Natural organic pigments: These pigments are obtained from animal products and plant products. The use of these pigments is rare due to their poor light fastness property.
- Ex: Indigo Blue or Weld Yellow.
- 2. Natural Inorganic pigments: These pigments are obtained from insects and plants and used in cosmetics.
- EX: Cochineal, Aeppo galls, Annatto, Indigo, Ochres Iron Oxides and Orpiment or Cinnabar

## Synthetic pigment also divided by two types.

- Synthetic organic pigments are carbon-based molecules manufactured from petroleum compounds, acids, and other chemicals, usually under intense heat or pressure. EX: Alizarin, Azo-pigments, Quinacridone family
- 2. Synthetic inorganic pigments: Synthetic inorganic pigments are created through chemical manufacturing rather than by grinding and washing clays or minerals taken directly from the earth.
- Ex: Sulphide, Chromate Titanium Dioxide etc.)



# Uses of Pigments:

- Use in natural, synthetic and glass fiber dyeing.
- It is mostly use for printing
- Use for blended fabric dyeing
- Use in dope dyeing
- It also used for the coloration of metal, wood, stone, soap, detergent, colored pencil, PVC, rubber, paper and other surfaces as paint.



# Advantages of Using Pigments

- 1. Applicable to all kinds of fibers and fiber blends
- 2. Compound shades are produced with ease
- 3. Easy and cheap process
- 4. Easy shade matching Environment friendly
- 5. The full-color range is available



# Disadvantages of Using Pigments

- 1. Depth of shade usually limited to light to medium
- 2. Make the fabric stiffer and so uncomfortable
- 3. Sometimes fastness
- 4. Rubbing is not good



# Questions

- 1. What is pigment and its types
- 2. What is pigment?
- 3. What is the classification of pigments?
- 4. what is use of pigment?
- 5. What are pigments and what is their purpose
- 6. Write the properties of pigments