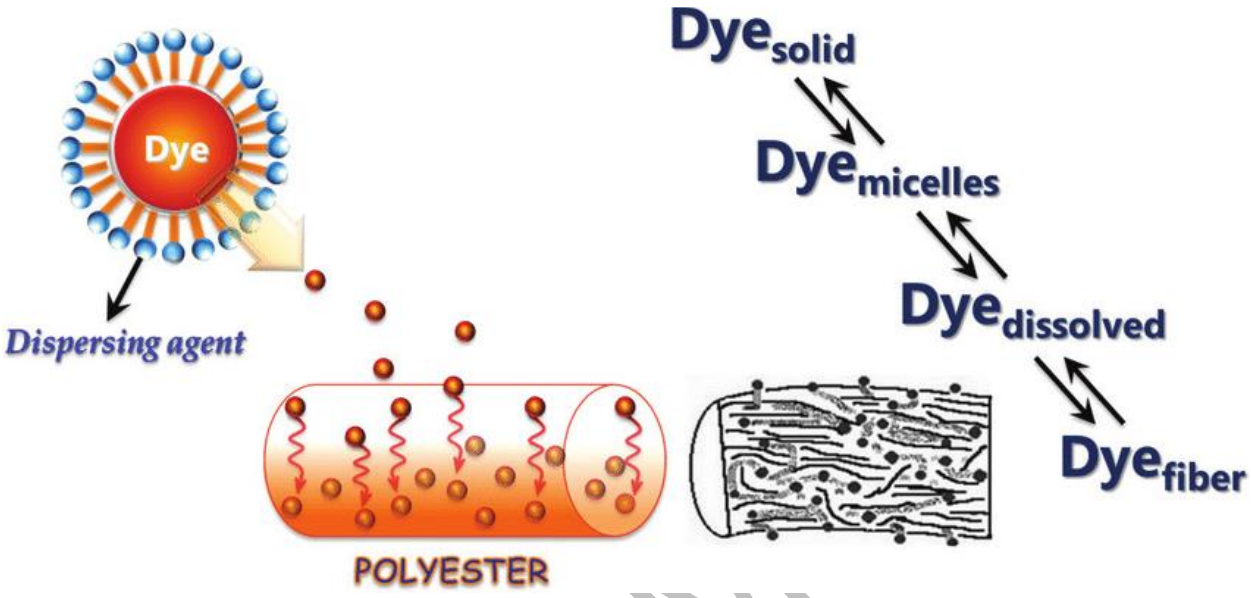
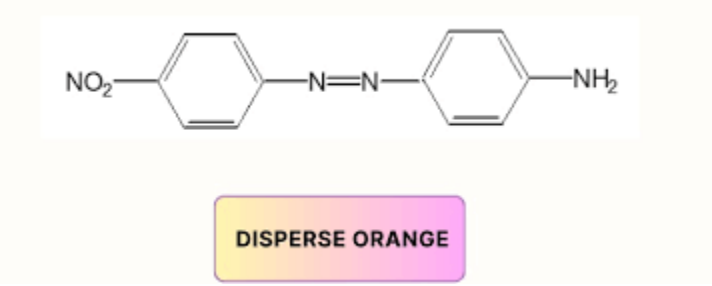
Disperse Dye



Disperse dye is a category of **synthetic dye** intended for **polyester and related hydrophobic fibers**. Disperse dyes are polar molecules containing **anthraquinone or azo groups**. It is estimated **that 85% of disperse dyes are azos or anthraquinone dyes**.



The dye has derived its name for its **insoluble aqueous properties** and the **need to apply it from an aqueous dispersion**.

Properties of Disperse Dyes

1. Disperse dyes are **nonionic dyes**.
2. They are **insoluble in water** or have very **low water solubility**.

3. They are suitable for dyeing **hydrophobic fibres**.
4. Attach to fiber by **Entrapping Process**.
5. **Dispersing agent** is required for dyeing.
6. **Need high temperature** for proper dyeing**.**
7. Disperse dyes have **fair to good light fastness** with rating about 4-5.
8. Generally, disperse dyes are derivatives of **azo, anthraquinone, nitro and quinine groups.**

Mechanism of Disperse Dyeing

- The dyeing of **hydrophobic fibers like polyester fibers** with disperse dyes may be considered as a process of **dye transfer from liquid solvent (water) to a solid organic solvent (fiber).**
- Disperse dyes are added to water with a **dispersing agent** to form an **aqueous dispersion**. The application of **heat to the dye liquor** increases the energy of dye molecules and accelerates **the dyeing of textile fibers**.
- **Heating of dye liquor swells the fiber** to some extent and **assists the dye to penetrate the fiber polymer system**. Once taking place within the **fiber polymer system**, and after removing the heat the fiber return to the original form and the dye molecules entrapped within the fiber morphology.

Classification of Disperse Dyes

1) **Chemical classification:**

- ✓ Nitro dyes
- ✓ Amino keton dyes:
- ✓ Anthraquinonoid dyes
- ✓ Monoazo dyes
- ✓ Diazo

2) According to fastness properties:

- **Group A:** these dyes have excellent dyeing properties and good fastness.
- **Group B:** these dyes are excellent in high temperature and for carrier dyeing, with moderate fastness
- **Group C:** these dyes are moderate for carrier and high temperature dyeing with higher fastness properties than Group-B dyes.

- **Group D:** these dyes are of excellent high fastness to that but poor dyeing properties on carrier dyeing.

3) According to Energy Requirement

- **Low energy dyes:** These dyes are used to **dye with carrier**. For dyeing **77°C temperature is required**. They have extremely **poor resistance to sublimation.**
- **Medium energy dyes:** These dyes are used to dye mostly in between temperature **104°C - 110°C** which provides better **sublimation fastness than that of low energy dyes**.
- **High energy dyes:** These dyes are used to dye at temperature above **129°C and are suitable for continuous dyeing**. They provide all **round fastness properties.**

Application Methods of Disperse Dyes

1. **Method N:** Normal dyeing method. Dyeing temperature is between 80-100°C.
2. **Normal NC method:** Method of dyeing at normal temperature with carriers. Dyeing temperature is between 80-100°C.
3. **Method HT:** High temperature dyeing method. Dyeing temperature is between 105-140°C.
4. **Method T:** Thermasol dyeing method. Dyeing temperature is between 180-220°C, continuous method of dyeing.
5. **Pad roll method:** Semi continuous dyeing method.
6. **Pad steam method:** Continuous dyeing method.

Factors Considered for Selection of a Method

1. Availability of dyeing machine.
2. Required color effect (dark/medium/light).
3. Required color fastness.
4. Type of material to be dyed.
5. Cost of dye, chemicals and auxiliaries.
6. Overall economy of the system.
7. Dyeing temperature