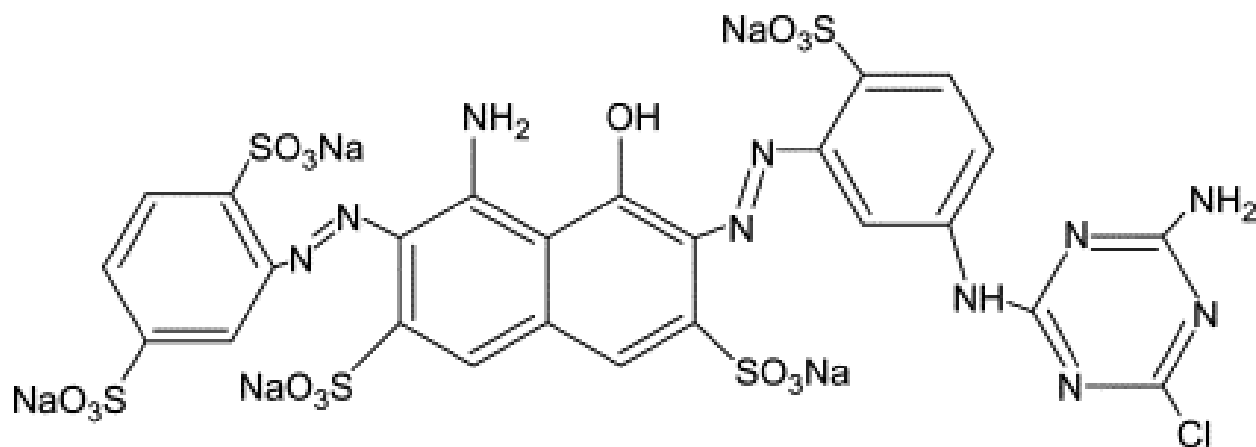


Reactive Dye



Reactive dye is the dye that can react with a fibre to **form a covalent link**, that is forming a **permanent attachment** in the fibre and could not be **removed by repeated treatment** with boiling water under **neutral conditions**.

Or,

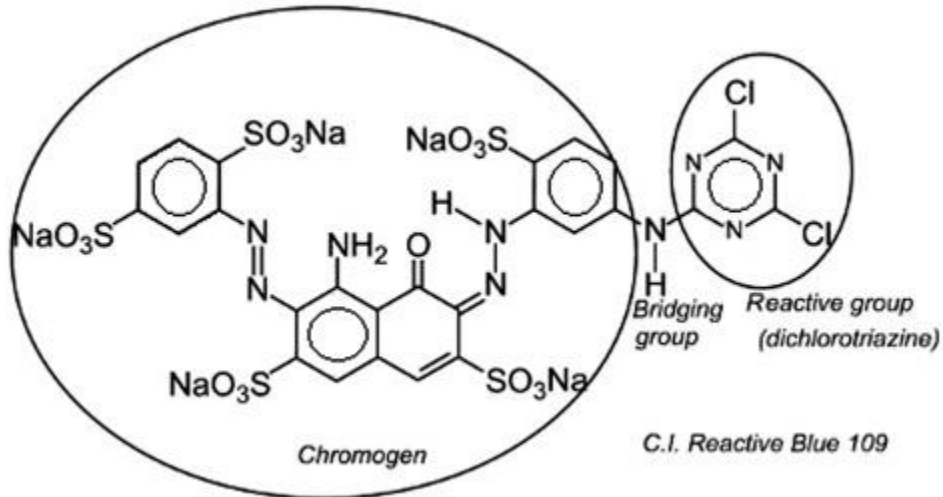
A dye, which is **capable of reacting chemically** with a substrate to **form a covalent** substrate linkage, is known as reactive dyes.

Properties or Characteristics of reactive dye:

- ✓ Reactive dyes are **anionic dyes**,
- ✓ use for **dyeing cellulose, protein and polyamide fibres**.
- ✓ Reactive dyes are found in **power, liquid and print paste** form.
- ✓ Contains reactive group in its structure
- ✓ During dyeing the reactive group of this **dye forms covalent bond with fibre polymer**
- ✓ Reactive dyes are **soluble in water**.
- ✓ They have **very good light fastness with rating about 6**.
- ✓ Reactive dyes have **very good wash fastness with rating about 4-5** due to **strong covalent bonds** formed between fibre polymer and reactive group of dye.
- ✓ Reactive dye **gives brighter shades** and has **moderate rubbing fastness**.

- ✓ Dyeing **method of reactive dyes is easy**. It requires less time and low temperature for dyeing.
- ✓ Reactive dyes are **comparatively cheap**
- ✓ Reactive dyes have good **perspiration fastness with rating 4-5**.

Structure of Reactive Dye



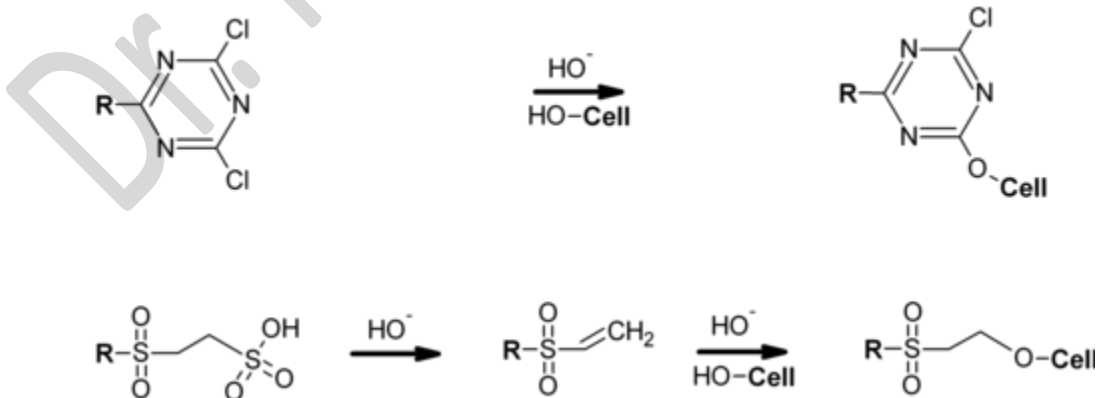
Reaction:



Here,

D= dye part.

Cell = cellulosic polymer.



Why reactive dye is so called?

Reactive dyes are so called because this is the **only type of dye**, which has **reactive group**, and that reactive group reacts **chemically with fibre polymer molecules** and **form covalent bond**. This covalent bond is formed **between the reactive group and terminal –OH (Hydroxyl) group** of cellulosic fibre and wool fiber or between reactive group and **terminal -NH₂ (Amino) group** of polyamide polymer. The **strength of this covalent bond is more than ionic bond, hydrogen bond and Vander Waal's force of attraction**.

For this reason, the dyes are so called. They are also called '**fibre reactive group**'.

History:

On the occasion of 100 year's celebration of synthetic dyes manufacturing, two chemists of **ICI company (UK) named Stephen and Rattee** tried to manufacture a new dyestuff. Thus, they succeed to invent a **new dye in 1965**, which was named **REACTIVE DYE**. This was manufacture for **dyeing cellulosic fabrics**. The first three reactive dyes were **PROCION YELLOWR, PROCION BRILLIANT RED 2B and PROCION BLUE 3G** for this effort they were awarded **gold medal of the society of dyes and colorists**.

Trade names of reactive dye:

Trade name	Manufacturer	Country
Procion	I.C.I	U.K
Ciba cron	Ciba	Switzerland
Remazol	Hoechst	Germany
Levafix	Bayer	Germany
Reactone	Geigy	Switzerland
Primazin	BASF	Germany
Drimarine	Sandoz	Switzerland

Popularity of reactive dye:

Reactive dyes are mostly used for **dyeing cellulosic fibres**. At past **cellulosic fibres were dyed with direct and vat dyes**, but after the introduction of reactive dyes, **their utility has become limited**. Reactive dyes are superior to direct dye in the following aspects:

- Ability to procedure bright shades of wide range.
- High leveling quality.
- Good washing fastness.
- Good light fastness.

And it is superior to vat dyes in the following aspects:

- Simple dyeing method therefore one stage dyeing.
- Low temperature dyeing (below 100°C)
- Lower cost, i.e. cheaper.

Again its **dyeing process is fast** and gives **brighter shades than metallized azo dyes**. For the above reasons reactive dyes are more popular.

Classification of reactive dyes:

Reactive dyes may be classified in various ways as below:

A. On the basis of reactive group:

i. Halogen derivatives

- ✓ Triazine group
- ✓ Pyridine group
- ✓ Quinoxaline dyes

Example:

- ✓ Triazine derivatives: procion, cibacron.
- ✓ Pyridine derivatives: reactone
- ✓ Quinoxaline derivatives: levafix.

ii. Activated vinyl compound:

- ✓ Vinyl sulphone
- ✓ Vinyl acrylamide
- ✓ Vinyl sulphonamide.

Example:

- ✓ Vinyl sulphone: remazol
- ✓ Vinyl acrylamide: primazine
- ✓ Vinyl sulphonamide: levafix.

B. On the basis of reactivity:

- ✓ **Lower reactive dye:** Here pH is maintained 12-12.5 by using NaOH in bath.
- ✓ **Medium reactive dye:** here pH is maintained 11-12 by using Na₂CO₃ in dye bath.
- ✓ **Higher reactive dye:** here pH is maintained 10-11 by using NaHCO₃ in dye bath.

C. On the basis of dyeing temperature:

a. Cold brand:

These types of dyes contain reactive group of high reactivity. So dyeing can be done in lower temperature i.e. 30⁰-60⁰C.

For example: PROCION M, LIVAFIX E.

b. Medium brand:

This type of dyes contains reactive groups of moderate reactivity. So dyeing is done in higher temperature than that of cold brand dyes i.e. in between 60⁰-70⁰C temperatures.

For example, Remazol, Livafix are medium brand dyes.

c. Hot brand:

This type of dye contains reactive groups of least reactivity. So high temperature is required for dyeing i.e. 70⁰-95⁰C temperature is required for dyeing.

For example PRICION H, CIBACRON are hot brand dyes.