

## Improving Colourfastness of reactive dyeings – a dream or reality ?

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THE days of unlimited availability of resources like time, water and energy is long over. Today the modern dyer has to carry out dyeing and after-treatment of textile goods with limited availability of utilities in order to stay profitable. At the same time he has to maintain high standards of quality with minimum wastage while conforming to various stringent ecological standards set by his buyers.

Achieving required “fastness” ratings for dyed goods is a major challenge for modern dyers, Fastness in general is the resistance of colour on the dyed substrate towards various kinds of in- process and testing stresses. It is a complicated subject where the fastness results depend upon various components like the quality of substrate, type of dyes used (dyestuff chemistry), depth of shade, dyeing process parameters and after-treatment

Different colour fastness tests are employed in the industry today, so as to replicate conditions of normal use by the end user. These tests help to identify the problems and shortcomings so that corrective steps can be taken by the dyer to achieve accepted quality levels. Test methods are formulated by standardization bodies like BIS, ISO, AATCC, ASTM, DIN, BS,EN etc. While each standard has its own differences, the guiding principle of all these standards is the same. Most colour fastness tests use the standard multifibre fabric (MFF) which incorporates 6 or more different types of fibres like acetate, cotton, nylon, polyester, acrylic, wool etc. Another substrate used for testing colour fastness to rubbing is a bleached un-mercerized 100% cotton fabric without optical brightener. Assessment of colour fastness is usually done with the use of grey scales which has a range of rating from 1 ( very poor ) to 5 ( excellent ). Grey scales are of two types, one for testing change in shade and the other for testing the extent of staining

Fastness properties of reactive dyed material depend upon

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two factors : the chemistry of dyestuff used for dyeing and the dyeing process itself. Some examples are given below :

Fastness tests	Influencer	Remedies
Fastness to light	Dye related	UV resistant finish to be done
Fastness to Perspiration	Dye related	Right choice of dyestuff to be made
Fastness to chlorinated water	Dye related	Right dye fixing agent to be used
Fastness to burnt gas fumes	Dye related	Right choice of dyestuff to be made
Fastness to washing	Process related	Better soaping agent, cationic fixer to be used
Fastness to wet contact	Process related	Better soaping agent, right cationic fixer to be used
Fastness to rubbing	Process related	Better soaping agent, cationic fixer, suitable finishing to be used

Right choice of dyestuff pertains to choosing the dyestuff with the right chromophore ( Azo or Anthraquinone ) for the fastness requirement. Chromophore is the chemical group in the dyestuff molecule which contributes to the colour of the dye. Each type of chromophore have their own advantages and disadvantages

Process related influencers are mostly to do with the residual unfixed dye (hydrolyzed dye / hydrolysates) that stubbornly remain on the dyed material. Unfixed dye molecules if present will lower the washing, wet contact and rubbing fastness ratings of the dyed material. In order to minimize the negative effects of the unfixed dyes on fastness properties two approaches are undertaken :

### Minimizing the amount of residual unfixed dye molecules on the dyed material

The dyeing process should be well controlled to ensure highest possible colour yield ( highest possible amount of dyes fixed onto the material ) and therefore left with less unfixed dyes to be removed in the subsequent process of soaping. During soaping the selection of the soaping agent plays an important part to achieve desirable results. Soaping agents with anti-deposition properties can effectively minimize unfixed dyes on the soaped material. **Leomine Washoff WAF** is the fourth generation soaping-off agent which exhibits unbeatable soaping off performance. For more details

## PRODUCT UPDATE

on **Leomine Washoff WAF** please refer to the article titled 'Soap your way to success with a wonder soaping off agent' in the March'16 issue of Colourage magazine

### Fixing the residual unfixed dye onto the dyed textile material

Complete removal of unfixed dye from the dyed material is usually difficult to achieve especially in heavy shades. Use of a formaldehyde free cationic dye fixing agent is a must to fix the residual unfixed dyes onto the dyed textile material. This makes the dyed material resistant to various stresses like washing, rubbing etc. **Leomine Fast Fix FFF** is a robust formaldehyde free, dye fixing agent

The mode of action of the cationic dye fixing agent **Leomine Fast Fix FFF** is two fold viz. by anchoring action and improving substantivity action

In the anchoring action, **Leomine Fast Fix FFF** molecules first exhaust onto the substrate via ionic attraction due to surface negative potential ( Zeta potential ) to form a cationic linkage. The anionic dye hydrolysates are 'anchored' onto the fiber surface via cationic linkages. Due to the formation of these cationic-anionic adducts, the solubilizing groups of the dye hydrolysates are rendered insoluble in water thus restricting the bleeding and staining that are usually observed when cationic dye fixing agents are not used

In the improving substantivity action, use of **Leomine Fast Fix FFF** not only renders the adducts insoluble in water due to formation of cationic-anionic linkages but it also increases the substantivity of the adducts due to enlargement in its molecular size. The increase in the substantivity of the adducts molecules via stronger Van der Waals forces turns the reactive

dye molecules into larger pseudo direct dye molecules. This results in less migration and hence improved wet contact fastness

These enlarged pseudo direct dye molecules provide improvement in storage stability of dyed goods since the **Leomine Fast Fix FFF** molecules penetrate to the core of the fiber forming adducts with the fixed dye molecules resulting in increased substantivity of the resulting adducts preventing migration of dye molecules leading to excellent colour fastness

### Leomine Fast Fix FFF exhibits the following properties

- Formaldehyde free
- Conforms to Oekotex Standard 100
- Suitable for exhaust and padding applications
- Soluble in water in all proportions
- Readily taken up by the textile material
- Can be applied at room temperature
- Relatively low application dosage to achieve desired fastness levels
- Improves wash, wet and storage fastness of reactive/direct dyed and printed goods
- Does not affect the shade of reactive dyeings
- Does not affect fabric handle
- Can be combined with cationic and weakly anionic finishing agents

**Leomine Fast Fix FFF** works on the hydrolyzed dye molecules, anchoring them onto the dyed material arresting their mobility resulting in excellent wash, wet and storage fastness and thereby solving major problems for the modern dyer in one unbeatable stroke converting a dream into reality. ■

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