

## SUSTAINABLE TEXTILES – PART III

REF: TT/ MAY 2022/ WK 3

### Innovation of sustainable technologies in wet processing

New technologies have been developed in wet processing to contribute into sustainable textile production through conservation of resources as well as reduction of the toxic releases. Some of them are listed below.

- Enzyme technology
- Foam technology
- Supercritical carbon dioxide dyeing
- Plasma technology
- **Enzyme Technology** - Enzyme technology has gained popularity in the textile industry because of environmental friendly and energy conserving alternatives. In the cotton processing, the enzyme technology is used in various stages like desizing, scouring, bleaching, bio-finishing, bleaching cleanup to remove residual  $H_2O_2$  before dyeing. In garment care, detergent with enzymes is used to remove varieties of stains during garment laundry. In addition to cotton, enzymes have been introduced in wool and silk processing also. Conventional processes are replaced with enzymatic processes in case of anti-shrinking, anti-pilling of wool and degumming of silk with enzyme, retting of bast fibers. Effluent treatments are done through the use of several chemicals. As these chemicals are hazardous, they are being replaced by the use of enzymes. The application of enzyme technology in effluent treatments is more environmentally process.
- **Foam Technology** - Foam technology is an eco-friendly process that is being used in various fields of textile processing like pre-treatments, dyeing, printing, finishing, etc.

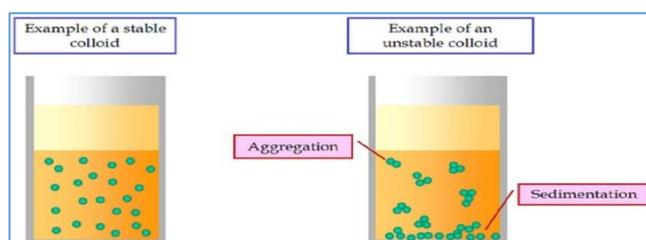


Fig 1.1 Example of colloidal system

Ref: chem.libretexts.org

### WHAT IS FOAM?

Foam is a colloidal system consisting of a mass of gas bubble in a liquid continuous phase.

This is the liquid dispersion which uses low water.



The foam finishing technology process is a novel application system for treating substrates with foamed chemicals at very low wet pick-ups. It involves the use of rapidly-breaking low-density foam as the delivery medium for finishing chemicals and flow control for delivery of foam to the substrate, pressure-driven impregnation of the foam into the substrate, and an applicator system designed to allow uniform high speed application and collapse of the foam in a single step. The semi-stable foam is necessary to get spontaneous foam collapse and spreading though the substrate. Foam dyeing and finishing of textiles is an economical technology to conserve energy. Foam finishing has a wide application on cotton, synthetic fibers and their blends. Any type of finish can be obtained using foam finishing technology. The main advantages of foam finishing technology are energy, dyes and auxiliaries saving and reduction of environmental pollution and generation of solid waste.

- **Supercritical fluid dyeing technology** - In this technology gas can replace water as solvating medium. Because of the high diffusion rates and low viscosities that allow the dye to penetrate into the fiber, CO<sub>2</sub> is the most suitable gas for this. In the supercritical state CO<sub>2</sub> exhibits very low viscosity and surface tension properties. Supercritical CO<sub>2</sub> is one of the most popular fluids used in manufacturing processes. In dyeing, Carbon dioxide has been the most widely used as super critical fluids because it is user friendly, non-explosive, non-toxic, and its recycling capability. The advantage of this process is that contaminated wastewater streams are not produced, washing of dyed fabric is not necessary. Carbon dioxide can penetrate into fibers faster than water and dyes can also be dissolved more easily that means the color yield value will also be high.
- **Plasma Technology** - Plasma technology is used for soil release and water repellent finishes in eco-friendly way. **“Plasma refers to a partially ionized gas that consists of ions, electrons and neutral particles.”** Plasma treatment does not involve handling of hazardous chemicals and thus there are no effluents. Plasma processing is a dry and environmentally friendly technique. It does not require huge volume of water, heating and drying, and less amounts of chemicals are necessary to achieve the desired functionality. Because the desired finishing property is achieved by modifying only the surface of fibres, physical properties of the material such as its tensile strength remains same.

References:

1. <https://www.2bfuntex.eu/>
2. <https://www.study.com/>
3. <http://www.fibre2fashion.com/>
4. <https://textileworld.com/>
5. <https://www.intechopen.com/>

.....To be continued.....

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