TEXTILE RAW MATERIALS AND TEXTILE DYES

TEXTILE FIBRES

In order to know what type of dyes and dyeing process to use, you need to know the fibre content of the fabric you are going to use.

Textile fibres can be classified as natural fibres and man-made fibres. Natural fibres are further divided into animal and plant fibres, and man-made fibres into regenerated and synthetic fibres.

All animal fibres are made of protein, and most of the plant fibres consist of cellulose. Synthetic fibres are oil-based and thus in many ways similar to plastics, and regenerated fibres are cellulose based. They are made of plant material or recycled cellulose products with a chemical process.

Two dye batches (green and salmon pink) with different types of cellulose fabrics, photo: Maija Fagerlund

CLASSIFICATION OF FIBERS

NATURAL FIBRES

PLANT FIBRES = CELLULOSE

- cotton CO
- linen LI
- hemp HA, jute JU, ramie RA, nettle
- manilla AB and sisal SI
- coconut CC

ANIMAL FIBRES = PROTEIN

- wool WO
- silk SE

- other hair e.g:
- alpaca WP
- mohair WM
- angora WA
- camel WK
- cashmere WS

REGENERATED FIBRES = CELLULOSE

- viscose CV
- lyocell CLY (Tencel)
- modal CMD

- New inventions such as:
- Ioncell
- Kuura (made from wood)
- Infinna (made from cellulose-rich waste)

SYNTHETIC FIBRES = OIL-BASED

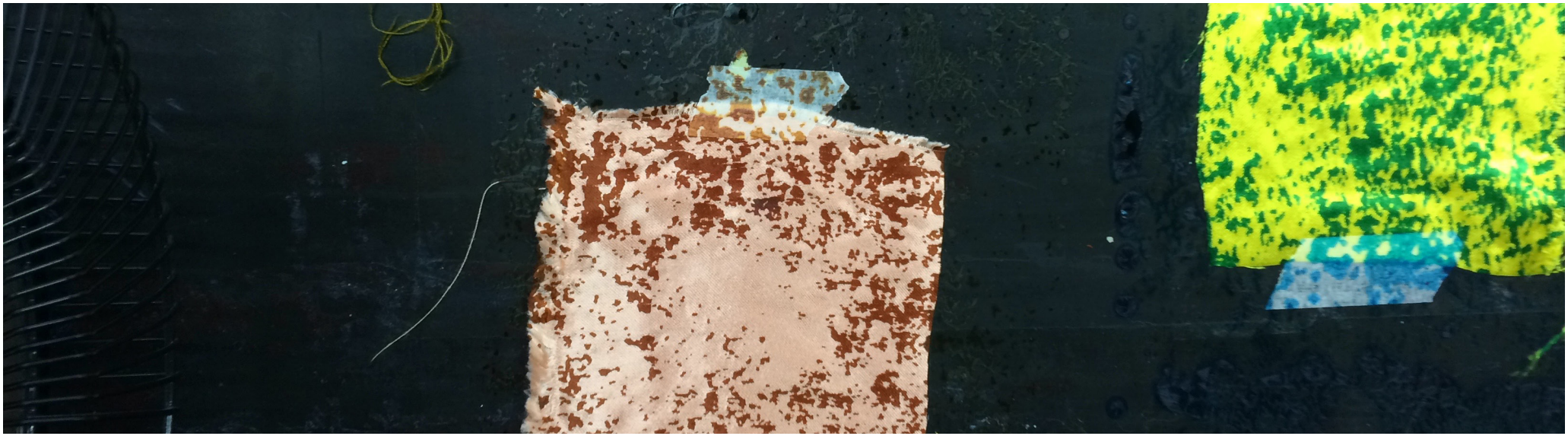
- polyester PES
- polyamide (nylon) PA

- other fibers e.g:
- polypropylene PP
- acrylic PAN (PC)
- elastane (EL)

TEXTILE DYES

Textile dyes might be classified on different grounds:

- One method is based on the chromophore, the part of a dye molecule that provides its colour. According to it, dyes can be divided for example in anthraquinone-, triphenylmethane-,phthalocyanine- and azo dyes.
- Another way for classification is based on the dye´s application method. According to it, dyestuffs can be divided into **pigment-, reactive-, acid-, vat-, disperse-, direct-, sulphur-, cationic and naphtol dyes.**
- For example anthraquinone- and azo dyes can provide the colour for pigment-,reactive- acid and disperse dyes.



Maija Pellonpää-Forss (2018) Contemporary Colour Methods, Sample prints and photo Helmi Liikanen

TEXTILE DYES

- Before 19th century all textiles were dyed with **natural dyes.** They are not one homogenous group, but can be classified for example by the application method into mordant dyes, direct dyes and vat-dyes, or by their source of origin into animal dyes, vegetable dyes and mineral dyes, or by their chemical compound.
- The dye industry had an important role in the development of modern chemistry in the 19th century, and first chemical dyes were introduced in the latter half of it.
- Due to their easier application processes, bright colours and good colour fastness, synthetic dyes soon almost completely replaced the use of natural dyes.
- First chemical dye was a lilac colorant mauveine, and synthetic indigo was developed soon after it
- Also the history of **Acid dyes** ranges back to 19th century, and they are commonly used even today for dyeing and printing on wool, silk and polyamide fibres.
- **Disperse dyes** can be used with several synthetic fibres, but work best on polyester, creating wide range of colours and good colour fastness properties with it. They were invented in the 1920's, and their use expanded together with the use of polyester itself in the 1950's.
- Disperse dyes can be used in dyeing and printing - either with direct printing, or with transfer printing, where the design is first printed on paper and then transferred with heat onto fabric

Maija Pellonpää-Forss (2018) Contemporary Colour Methods

- The first **reactive dye** was launched in 1956.
- The bonding method of reactive dyes to textile fibres is very different from earlier colorants. The dye molecule contains a reactive part, which forms a strong chemical bond (called covalent bond) to fibre, making the dye to became part of the material. Washing durability of reactive dyes is thus very good.
- Reactive dyes can be used with both cellulose and protein fibres. Protein fibers require low pH level and higher dyeing temperature than cellulose fibers – therefore cellulose and protein fibers require different dyeing processes.
- Reactive dye doesn't fix entirely to fabric (e.g. 70–98%) and the rest is left in waste water
- **Acid dyes** fix entirely to fabric and no extra colour is left in waste water
- Acid dyes on the other hand bond to textile fibres with an ionic bond, which is not as durable as the covalent bond reactive dyes use. Acid dyes washing durability is thus lower.
- **Pigment dyes** are used only in printing, but they can be used with all textile fibers
- Pigment dye fixes entirely to fabric, and no extra color is left in waste water.
- Pigment dye always needs a binder as a fixing agent

Maija Pellonpää-Forss (2018) Contemporary Colour Methods

Fabrics from Helmi Liikanen´s BA Thesis, Photo: Helmi Liikanen

Especially pigment, reactive and disperse dyes have - due to their relatively easy application processes, good colour fastness and almost endless variety of shades - transformed the way we understand colored textiles today:

We often take it for granted that any textile can be dyed to any shade.

However, it might be good to remember, that this has been the case for only a very short period of time in the history of textiles.

In this course we learn to use pigment and reactive dyes - what ever would we your approach to the world of dyeing and printing in the future, a good starting point is to understand how today´s textile industry works.