



# Outline

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- Introduction
  - Durability of Finish
  - Types of Finishes – thermal, chemical, mechanical
  
- Classification
  
- Routine Finishes
  
- Aesthetic Finishes
  
- Functional Finishes



## Introduction

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- **Finishes** are “all the processes through which fabric is passed after bleaching, dyeing, or printing in preparation for market and use...” (Source - *Dictionary of Fiber & Textile Technology*).
- Most finishes are applied to fabrics; they can also be applied to fibers, yarns, and products.
- Finishes are categorized based on:
  - **Durability** - permanent, durable, semi-durable, non-durable
  - **Application method** - thermal, chemical, mechanical
  - **Purpose** – routine, aesthetic, functional



# Introduction

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- The following are the durability categories for finishes:
  - A **permanent finish** lasts for the life of the fabric.
  - A **durable finish** lasts for the expected life of the product; finish effectiveness gradually diminishes after repeated laundering or cleaning.
  - A **semi-durable finish** loses effectiveness after repeated laundering and use and must be reapplied.
  - A **non-durable finish** such as starch is partially or completely removed after one laundering or cleaning.



# Introduction

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- In the textile manufacturing process, finishes are classified according to application method:
  - **Thermal finish** - Heat is applied to thermoplastic materials to produce a desired effect.
    - Example: permanent pleats in thermoplastic materials
  - **Chemical finishes** - Fabric is chemically reacted with the finish to produce a desired effect. Application may result in changes in other properties (tear or tensile strength); chemical finishes are applied under very controlled conditions.
    - Example: durable press finish
  - **Mechanical finishes** - Fabric is subjected to mechanical action to produce a desired effect; mechanical and chemical finishes are combined for some applications.
    - Example: napping of flannel fabric



# Finishes

## Routine Finishes

Sizing

Desizing

Scouring

Bleaching

Singeing

Tentering

Calendering

Mercerization

Fulling

Beetling

Weighting

Shearing

## Aesthetic Finishes

### Calendered Finishes

Embossing

Moiré

Glazing & Ciré

Schreinerling

### Abrasive Finishes

Napping & Brushing

Sanding & Sueding

Flocking

Burn-out

Denim Finishing

Plissé

Pleating & Crinkling

Stiffening

## Functional Finishes

Moisture Management

Temperature Regulation

Repellent & Release

Wrinkle Resistant &  
Durable Press

Antimicrobial

Shrinkage Control

Flame Retardant



## Routine Finishes

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- Routine finishes are typically required to **prepare** woven and knitted fabrics for dyeing and printing. Routine finishes are also used to prepare fabrics for sale.
- Some finishes are applicable for all fabrics; others are for specific fiber content or fabric construction.
- Considerable advances have been made toward using environmentally friendly chemicals and processes.



# Routine Finishes

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- Commonly used routine finishes are:
  - Desizing – removal of protective starch coating
  - Scouring – cleaning
  - Bleaching – whitening
  - Singeing and shearing- removal of protruding fibers
  - Tentering – alignment of yarns in a fabric
  - Calendering – pressing
  - Mercerization – caustic soda treatment of cotton
  - Fulling – shrinkage treatment of wool



# Calendering of Velvet Fabric



polished roller





# Aesthetic Finishes

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- **Aesthetic finishes** change the appearance and/or hand of fabric.
- Fiber content and yarn and fabric characteristics determine the suitability of a finish for the fabric.
- The following aesthetic finishes are included:
  - Calendered finishes – embossing, moiré, glazing, ciré
  - Abrasive finishes – napping, brushing, sanding, sueding
  - Flocking
  - Burn-out
  - Plissé
  - Pleating
  - Denim finishing



# Calendered - Embossing

- **Embossing** creates texture by giving the fabric a raised 3D effect produced by passing the fabric between an etched roller and a soft surface roller. The design from the engraved roller is imprinted on the fabric.
  - Embossed fabrics made with thermoplastic fibers are heat set permanently.
  - Embossed fabrics made of cellulosic fibers are treated with resin to make the finish durable.
- Cheaper fabrics resembling plissé are produced by embossing cotton and cotton blends. Embossing in place of plissé reduces cost, but the embossed design is often not as durable.



Embossed – Plain weave fabric with printed plaid design embossed to give the fabric a puckered plissé fabric look



Magnified view



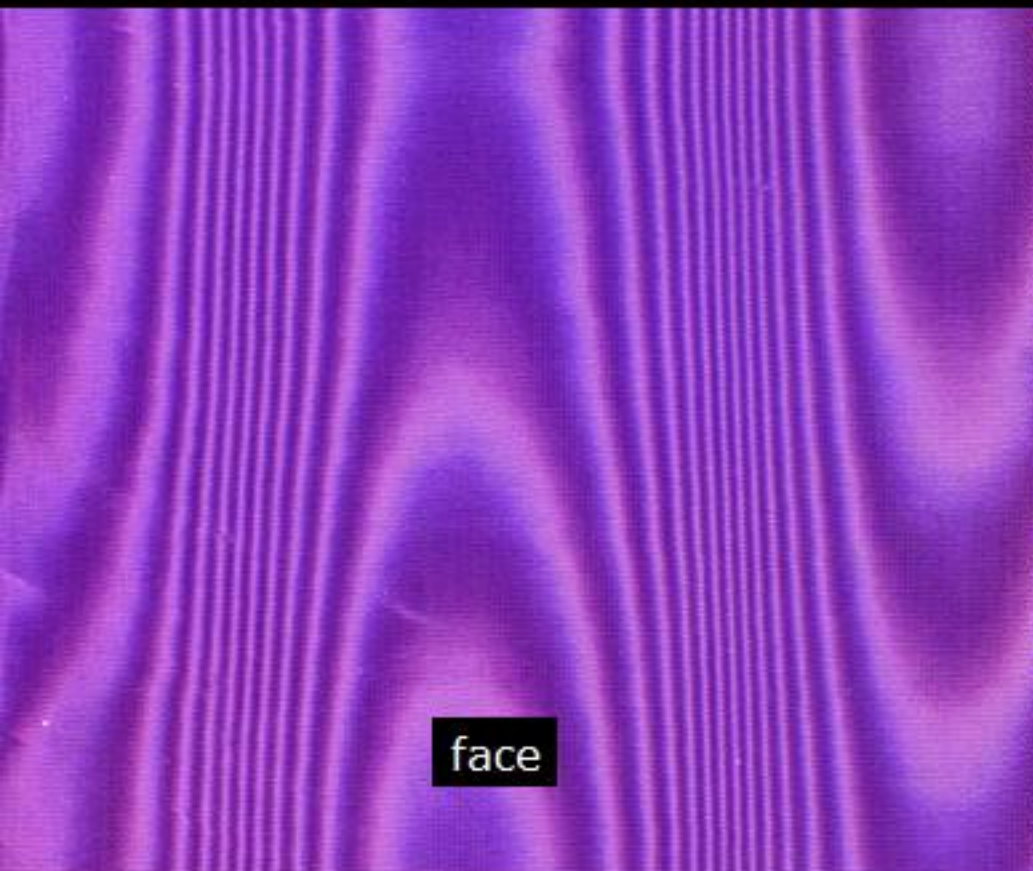


## Calendered - Moiré

- **Moiré** is produced by passing two layers of a rib weave (e.g., taffeta, faille, bengaline) fabric between rollers to flatten the ribs. Flattening the rib in certain areas alters the way light reflects off the fabric. Terms such as watermark and wood grain describe the appearance of moiré fabric.
- Heat applied during calendering produces a durable finish on synthetic fiber fabrics with thermoplastic properties (e.g., acetate, polyester).
- Moiré and imitation moiré print finishes are used for drapery, upholstered furniture, accent cushions, and formal dresses.
- Less expensive plain weave fabrics are printed with a moiré pattern to reduce cost.



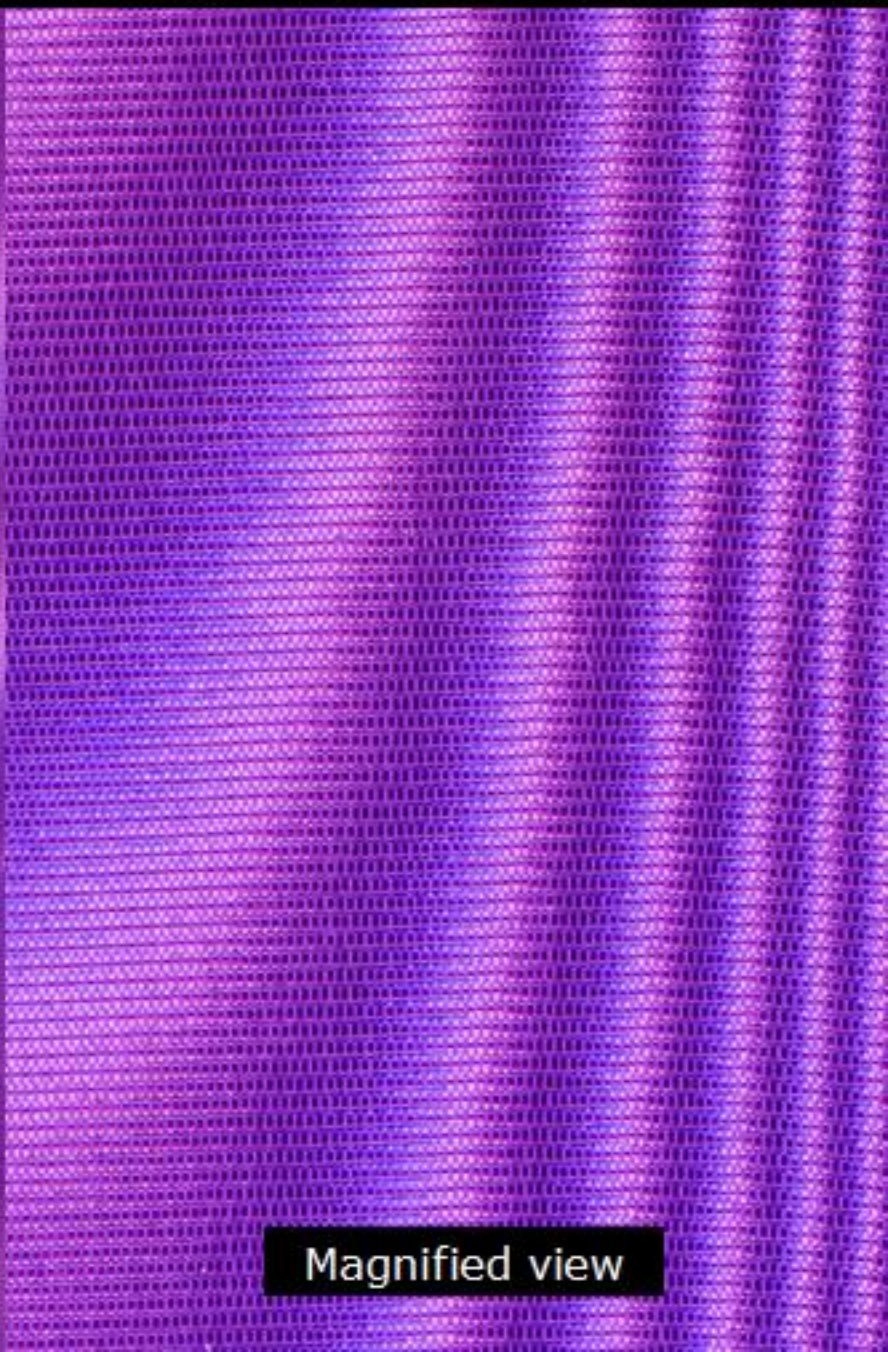
# Acetate Moiré Fabric



face



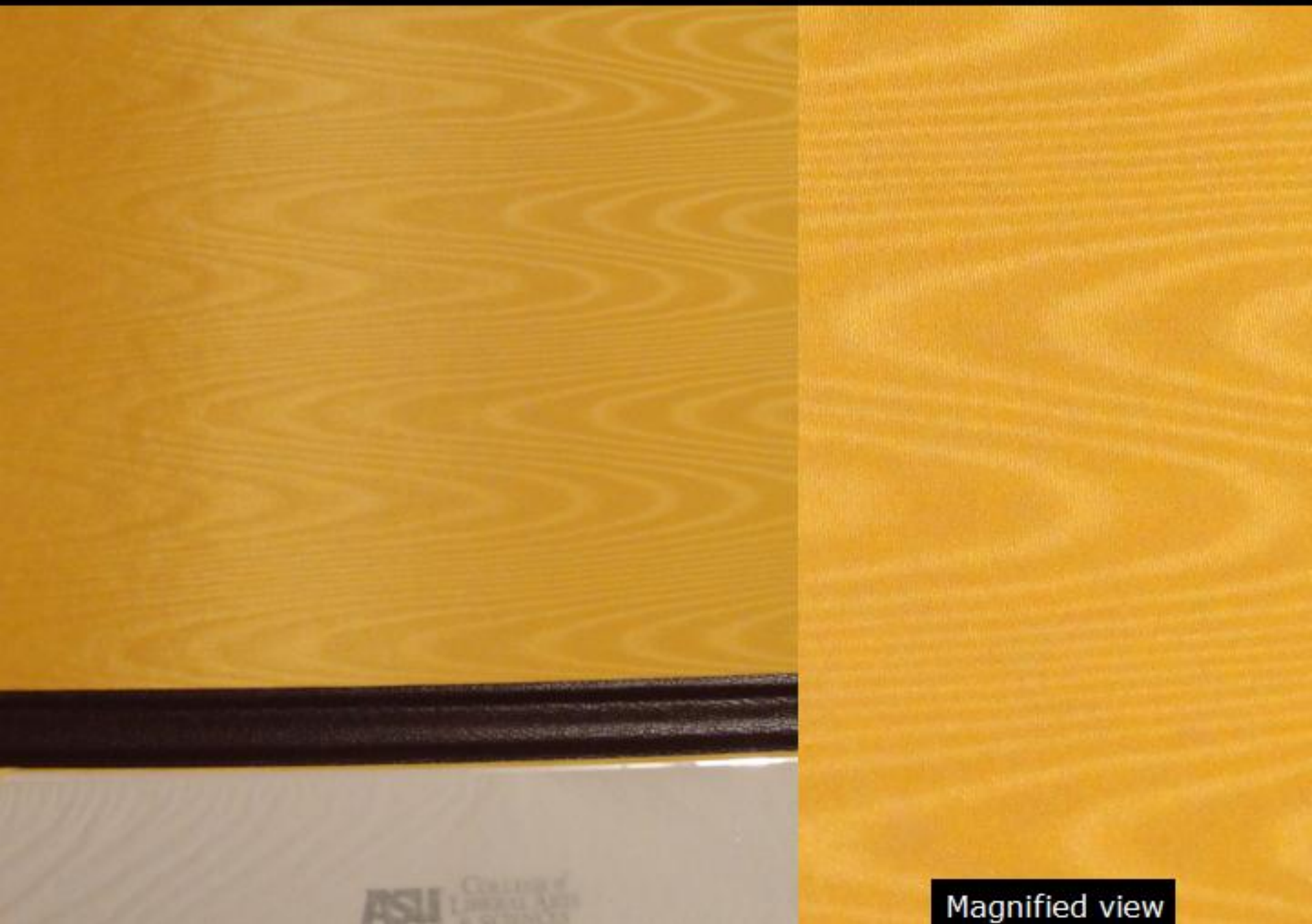
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Magnified view



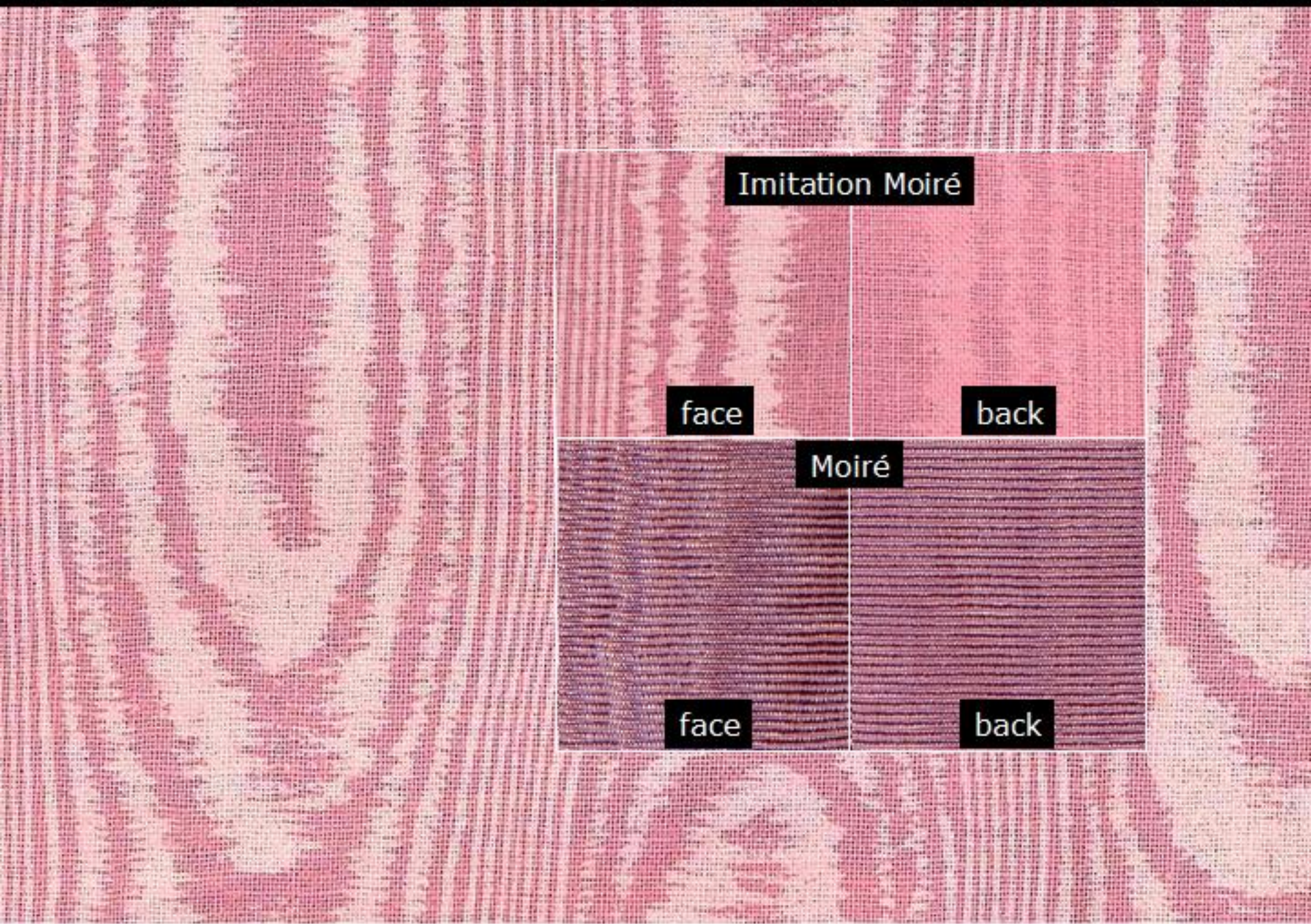
# Diploma Cover with Moiré Lining



Magnified view



# Imitation Moiré – Pattern printed on a plain weave fabric







## Calendered - Glazed and Ciré

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**Glazing** is produced by applying starch, wax, or resin prior to passing the fabric through very smooth rollers moving at high speed. The rollers add **luster** by flattening the fabric surface. The finish is temporary with starch or wax, and durable with resin.

- Glazed finishes are used for woven cotton fabrics. The level of gloss or shine varies.
- Examples: glazed chintz and polished cotton



Glazed – Sofa upholstered with cotton fabric with a glazed finish



Magnified view





## Calendered - Glazed and Ciré

- **Ciré finishes** are used for fabrics woven with thermoplastic fibers. The fabric is passed through high-speed, heated rollers that soften and polish the surface, creating a "wet look."
  - Ciré means "wax" in French.
  - Ciré is used for items such as backpacks, sleeping bags, and outerwear.



# Polyester Fabric with Ciré Finish Used for a Jacket





## Abrasive Finishes - Napping

- **Napping** is a mechanical finish where wire hooks are used to pull fibers from low twist yarns to produce a raised fabric surface.
  - Fabric can be napped on one or both sides of the fabric.
  - Napped fabrics can be produced only with spun yarns as fiber ends cannot be pulled from filament yarns.

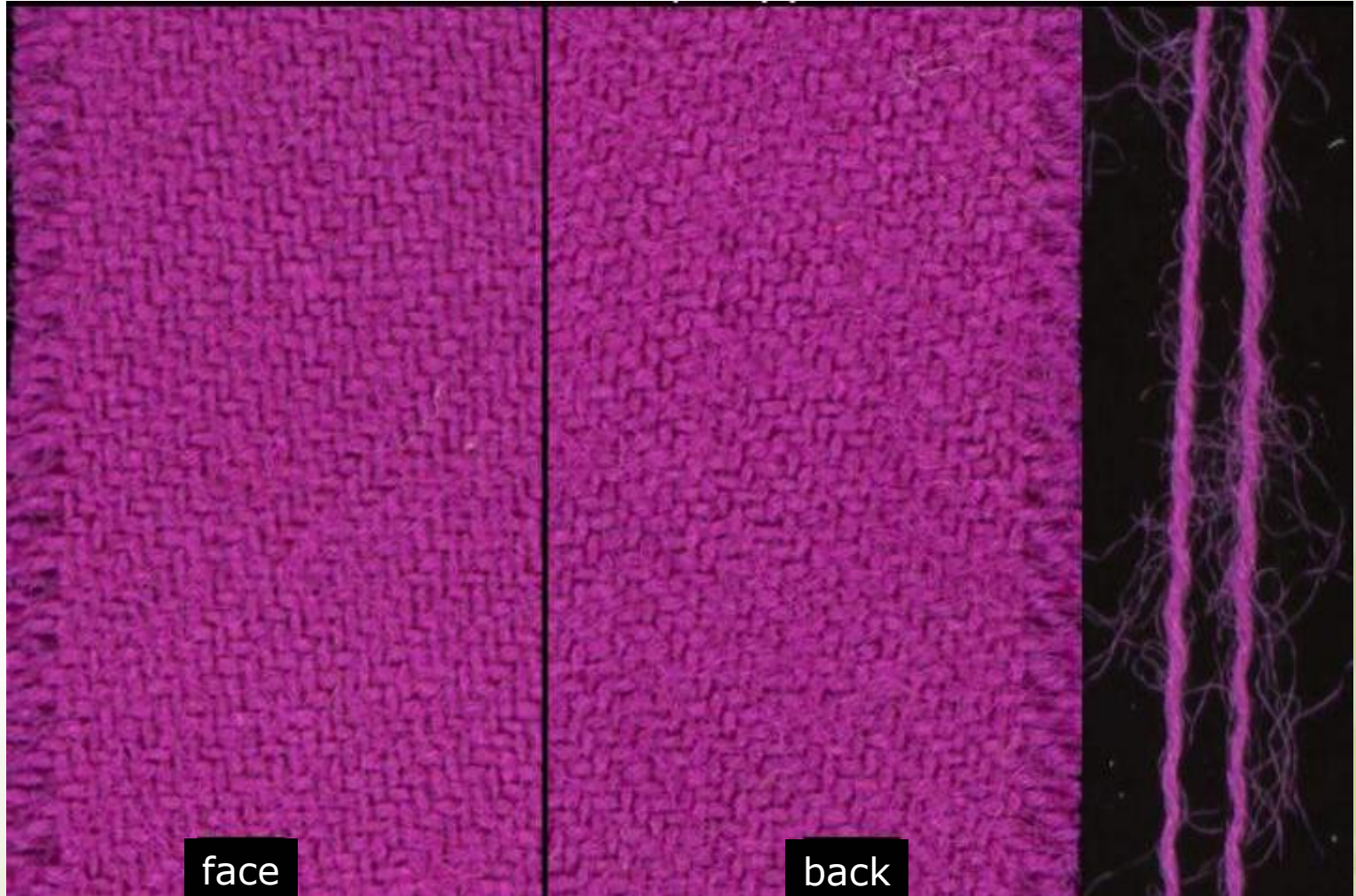






## Abrasive Finishes - Napping

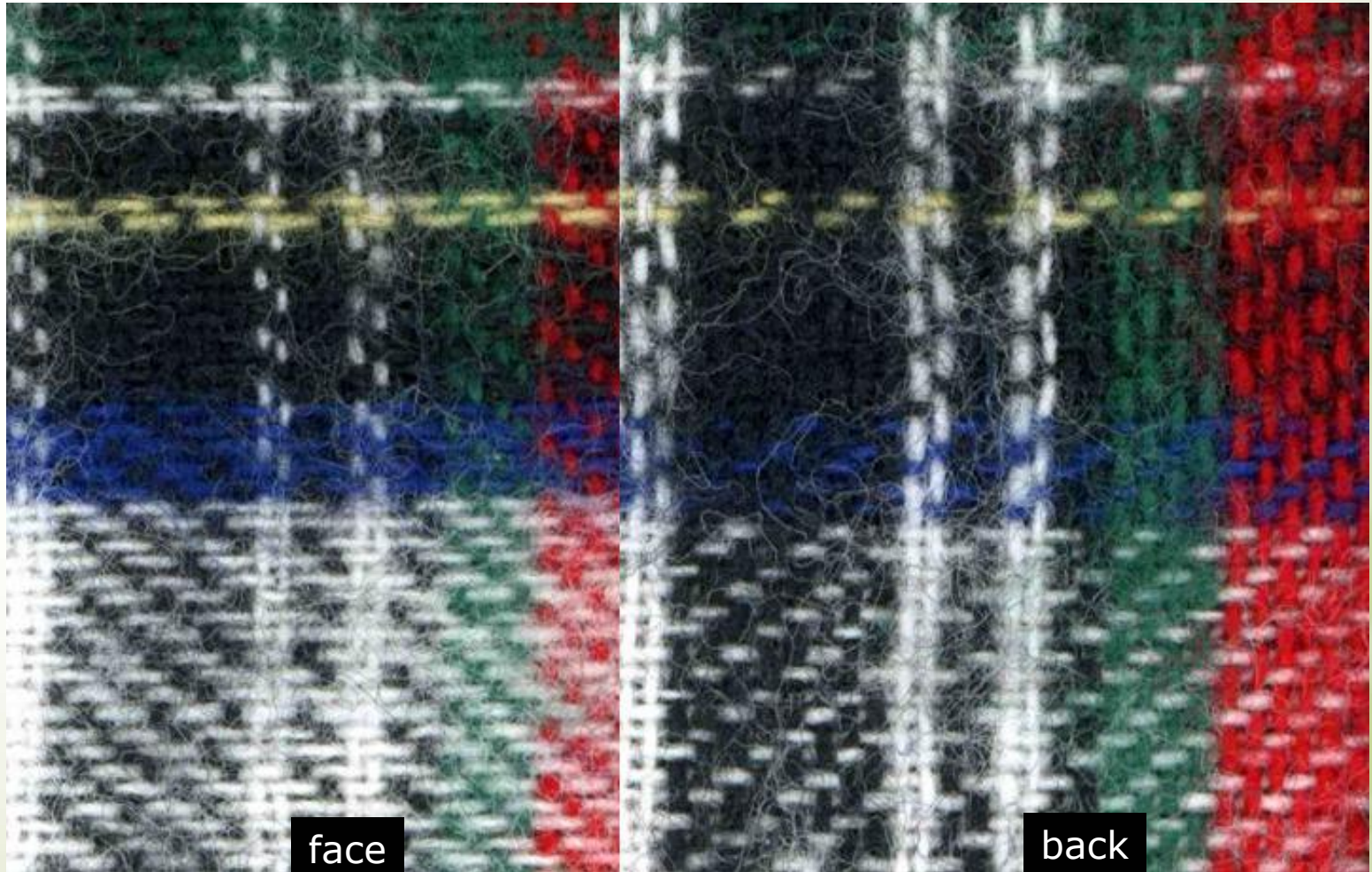
- **Worsted flannel**, used for suits and coats, is made by napping fabrics woven with worsted wool.





## Abrasive Finishes - Napping

- **Outing flannel** is a soft, cotton plain or twill weave fabric napped on both sides for sleepwear, children's clothes, and men's cold weather shirts.

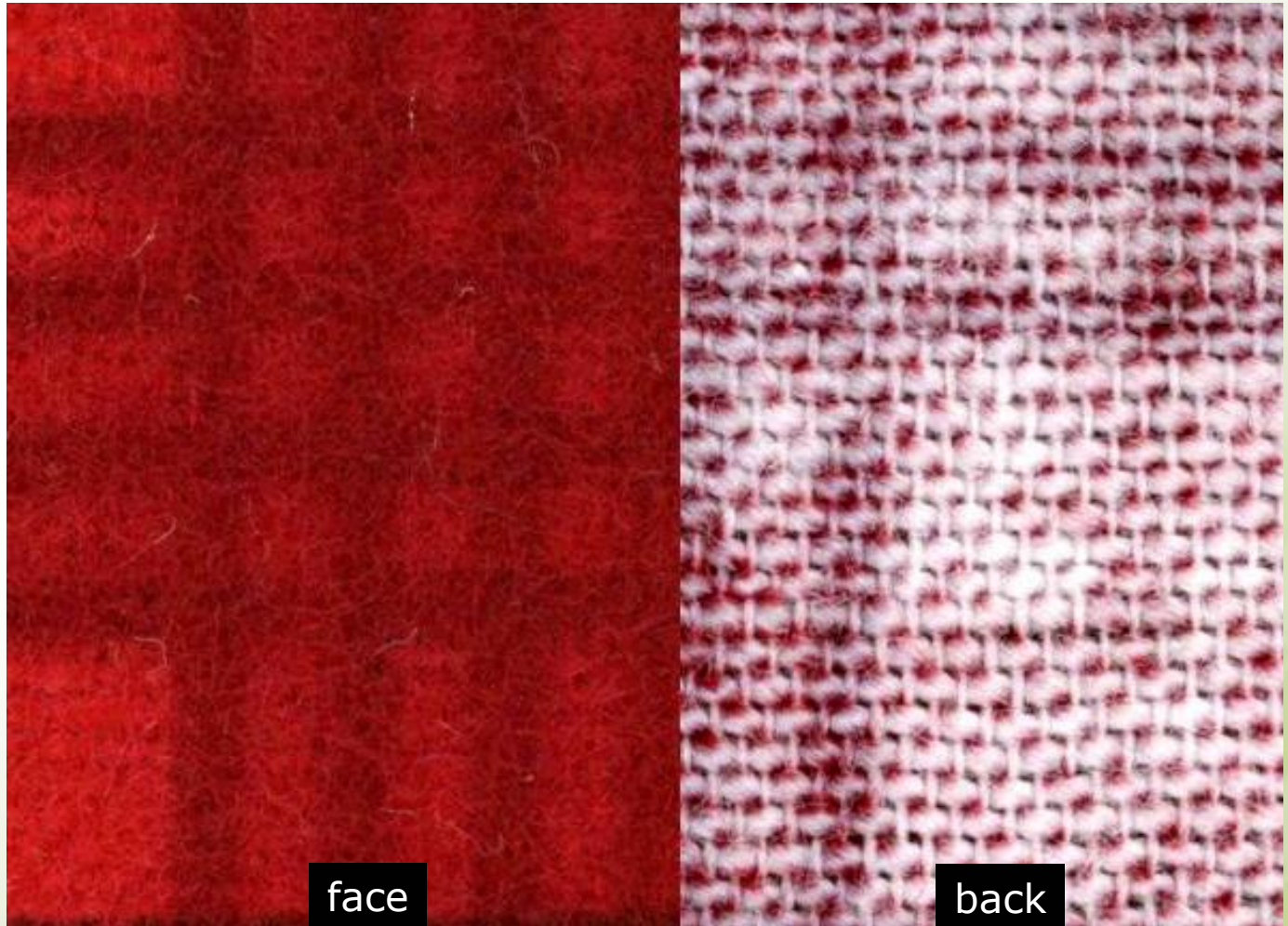






## Abrasive Finishes - Napping

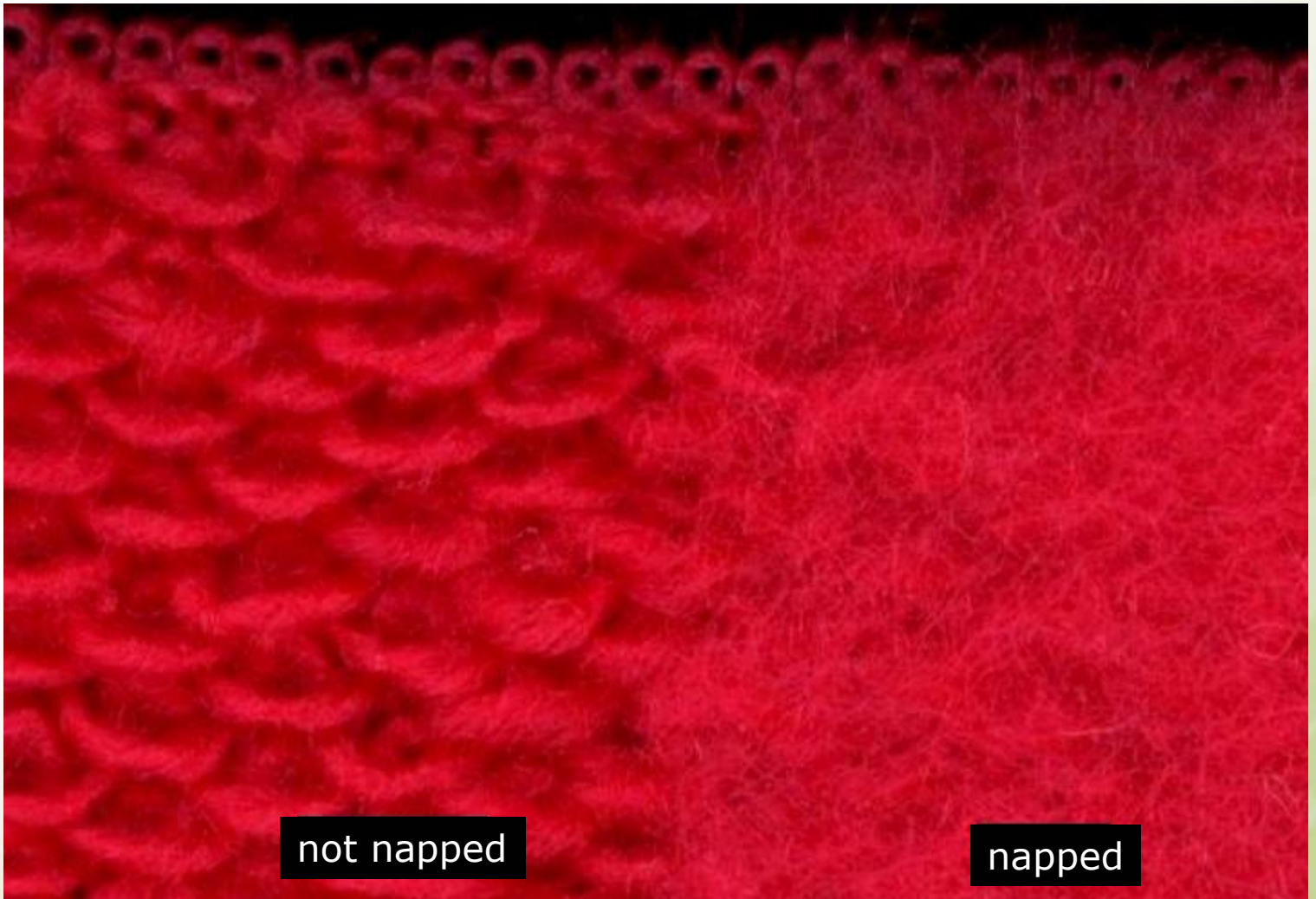
- **Flannelette** is a soft, cotton plain weave fabric napped on one side for pajamas, sheets, and diapers.





## Abrasive Finishes - Napping

- **Fleece** is produced by napping weft knit fabrics such as French terry.







## Abrasive Finishes - Brushing

- **Brushing** is a mechanical process that gently raises the fibers from the surface. It is also part of pile manufacturing, used to remove short fibers from the surface of the fabric.



# Brushed Cotton Twill Fabric

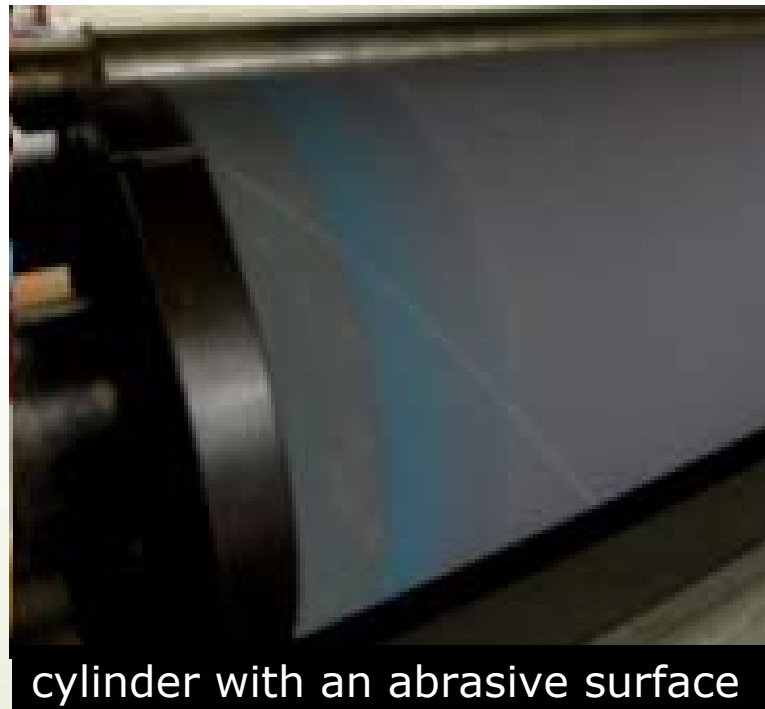






## Abrasive Finishes - Sanding and Sueding

- **Sanding and sueding** are mechanical finishes that alter the fabric surface. For both, the fabric passes between rubber pressure rollers and over an abrasive cylinder(s). Particles loosened from the fabric surface are removed with a brush.
  - Sanding, used for silk fabrics, gives fine fabrics a soft hand.
  - Sueding gives fabrics a suede-like effect.



cylinder with an abrasive surface



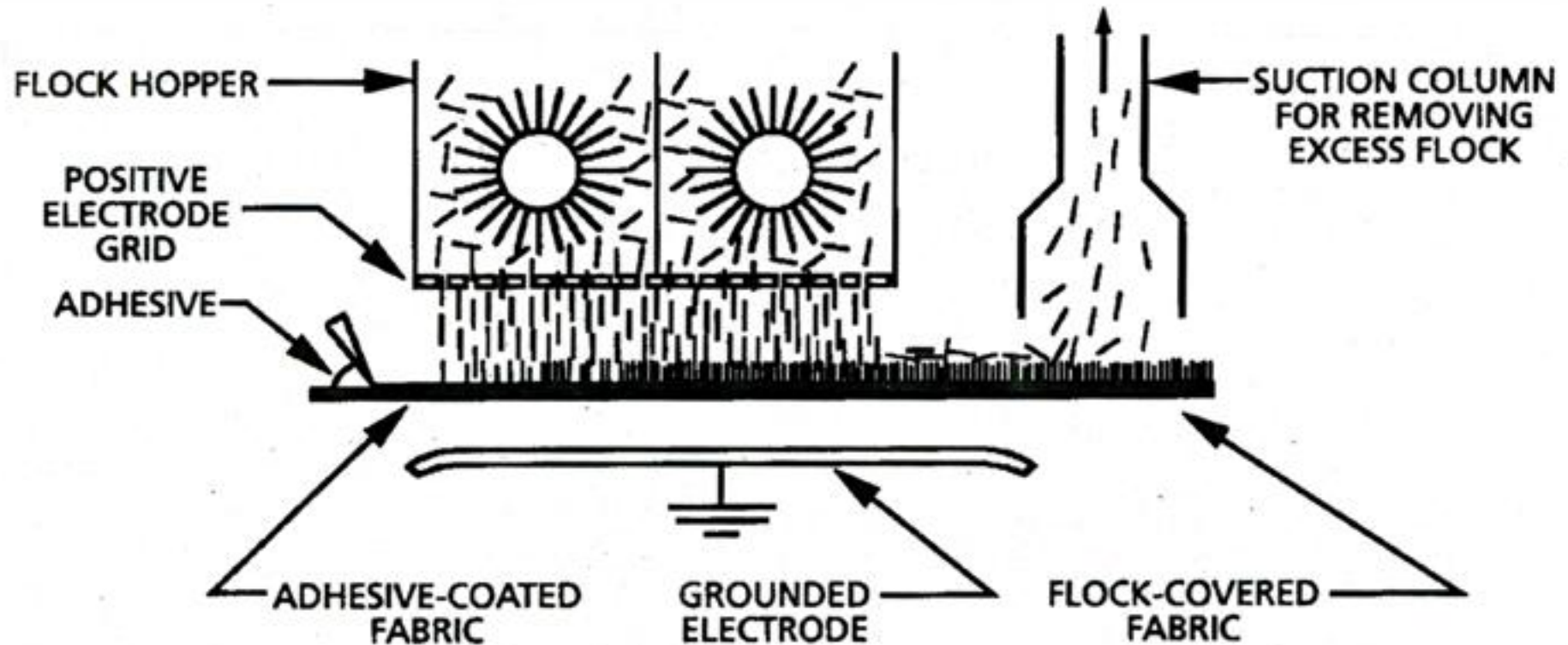
# Flocking

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- **Flocking** is a raised fiber finish or design where **short fibers**, or flock, **are attached with an adhesive** applied to the fabric surface.
- Fabric, adhesive, adhesive application method, flock characteristics and flock application method are major factors that affect the performance and cost of flocked fabrics. The end use of the flocked fabric determines the appropriate materials and application techniques.
- To create flocked designs, an engraved roller or rotary screen is used to print the fabric with an adhesive to which the flock fibers are glued to create a design.
- For a velvet-like effect, the entire fabric surface is coated with an adhesive and flock fibers.
  - Short, random-cut fibers are used for decorative and packaging materials.
  - Precision-cut fibers are used for apparel, blankets, and upholstery fabrics.



# Electrostatic Flocking



In this method, the electrostatic field is used to orient the flock fibers such that they are perpendicular to the substrate with the adhesive. For this method, the conductivity of the flock fiber adhesive is important. The charged flock fibers are attracted to the adhesive.



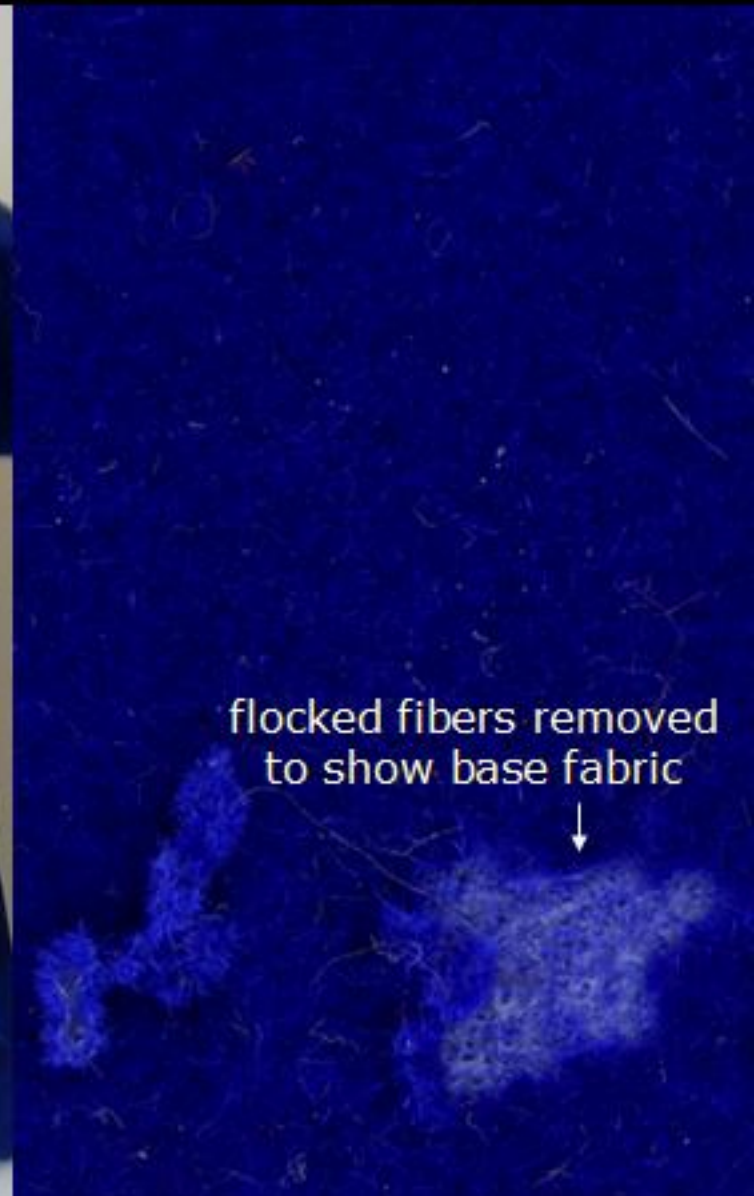
# Flocked Dotted Swiss (Imitation Dotted Swiss)



Magnified view



# Flocked Fabric – Gift box covered with flocked fabric that looks like velvet



flocked fibers removed  
to show base fabric



Magnified view



Flocking – A bedspread with short brown fibers glued to the fabric surface



Magnified view



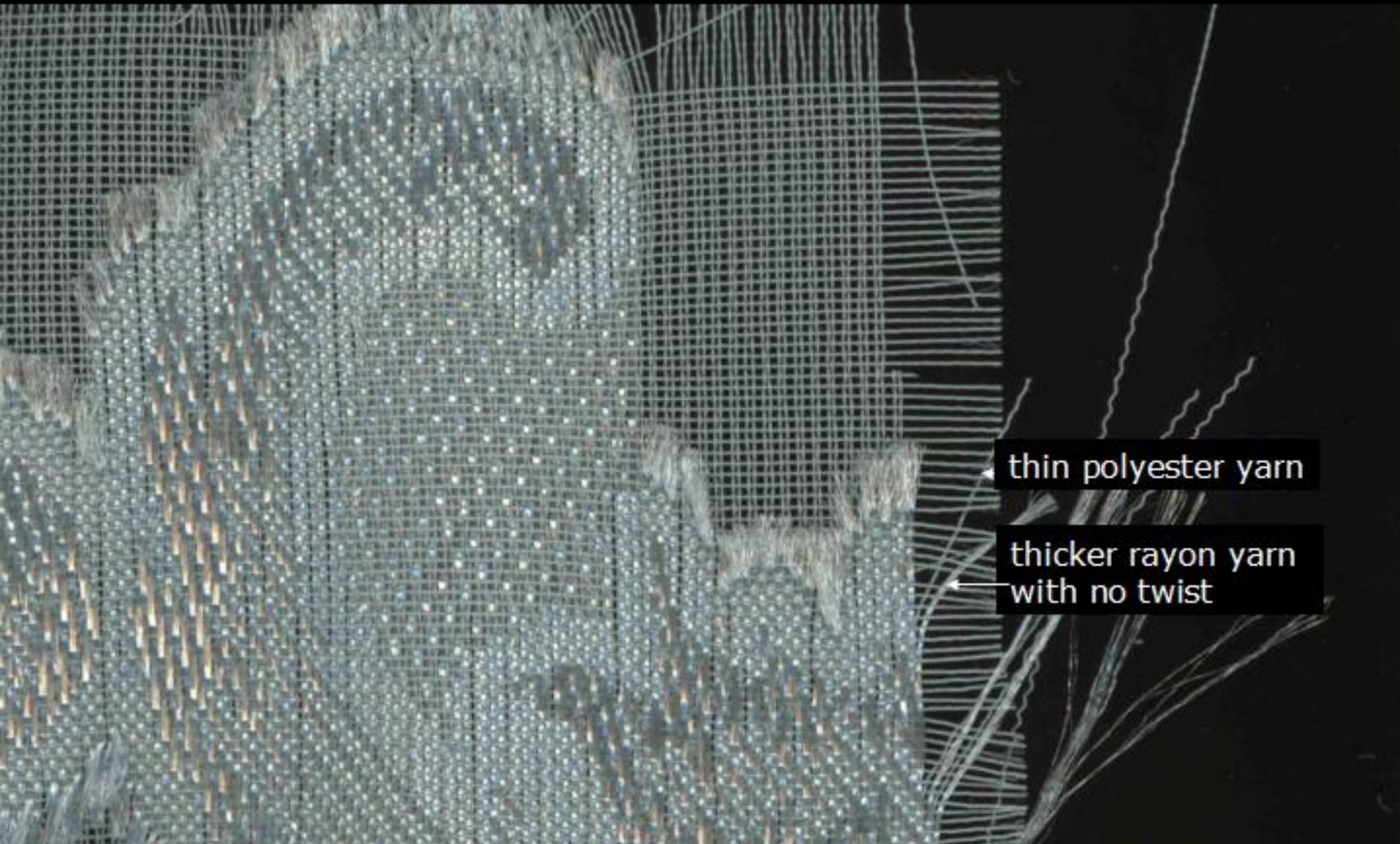
## Burn-out

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- **Burn-out** design is produced by dissolving one type of fiber in a fabric that is manufactured with two fibers.
- Burn-out finish can be used only for combination yarns or fabrics where one fiber is easily dissolved by a solvent or an acid, and the other is resistant to that chemical.
  - Acetone is commonly used to dissolve acetate fibers from combination yarns and fabrics, and sulfuric acid is employed to dissolve cellulosic fibers such as rayon.
  - Polyester and silk are often used as fibers that are resistant to solvents and acids.
- The appearance of burn-out finishes depends on fabric construction:
  - In flat fabrics, burn-out is characterized by a sheer area with fringe around the edge of the sections where the chemical was applied.
  - In velvets, the design is created by dissolving the pile in certain areas; thus, the base fabric is visible. The raised design may resemble that of flocked fabrics.



# Burn-out Design on a Polyester/Rayon Combination Fabric



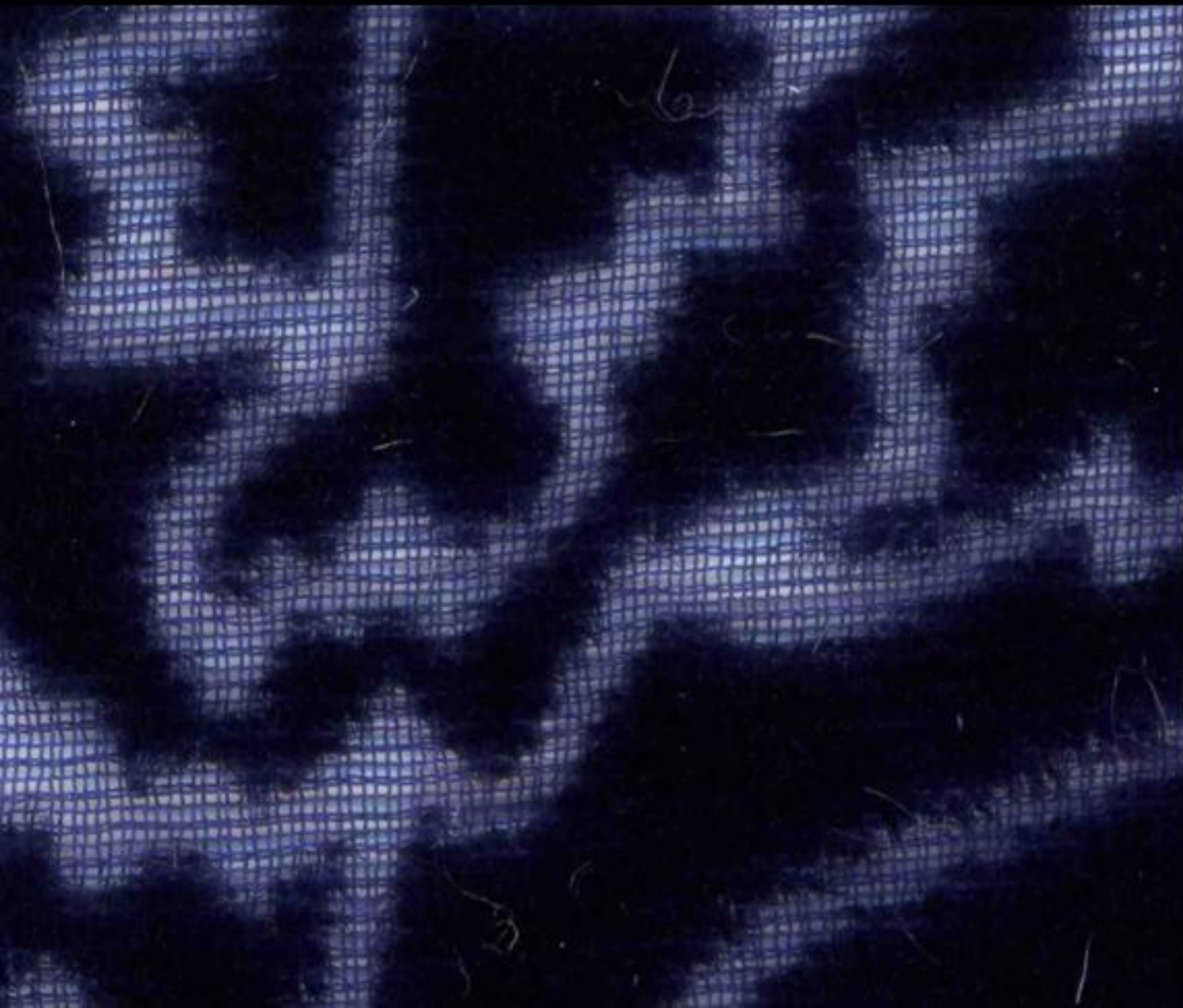
thin polyester yarn

thicker rayon yarn  
with no twist

Note: Rayon and polyester yarns in the jacquard weave fabric alternate in the warp direction. The rayon yarns dissolve to create the burn-out design.

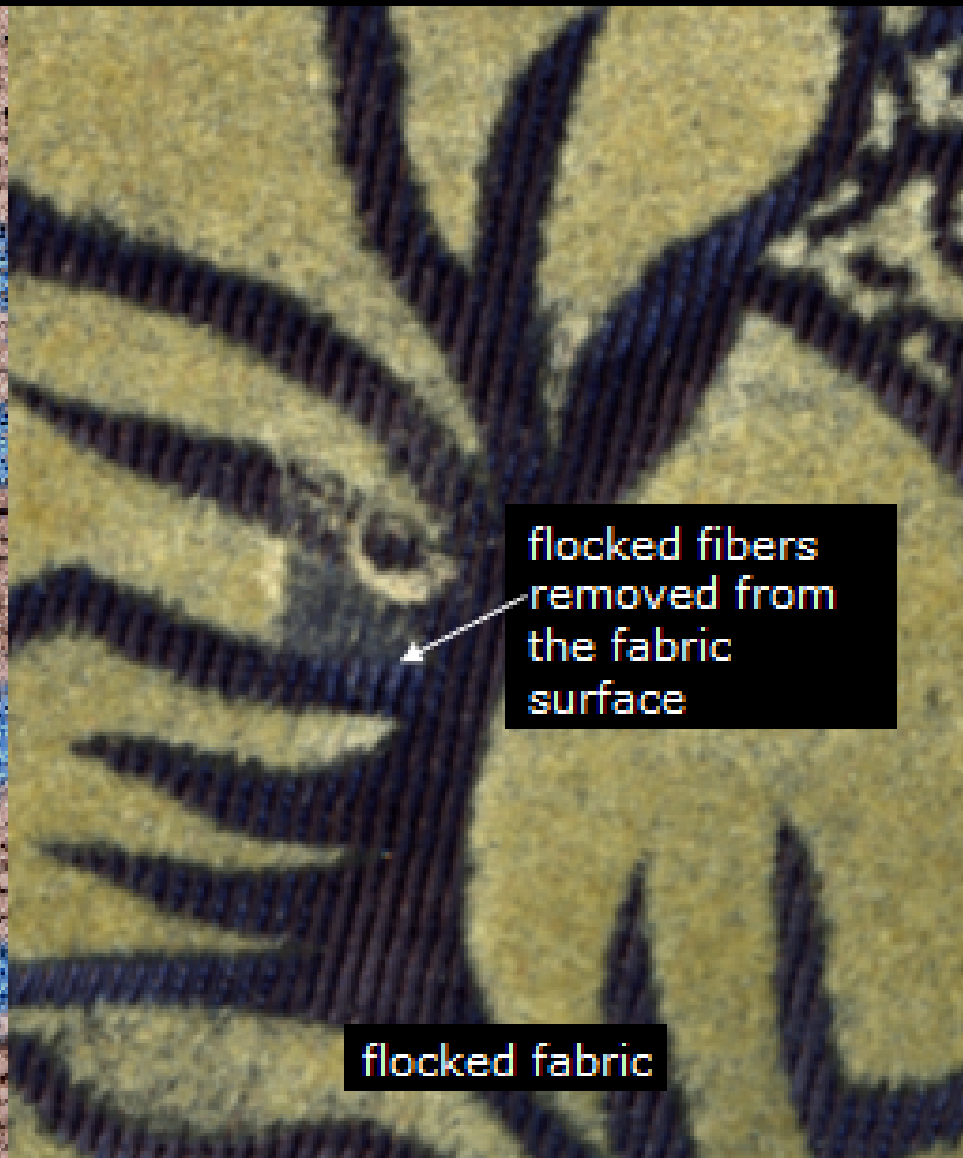


# Burn-out Velvet (Devoré Velvet)



Magnified view

# Burn-out Velvet and Flocked Fabric



Note: The pile from the burn-out velvet cannot be removed as they are woven into the fabric, whereas the flocked fibers typically can be removed by scratching the surface of the fabric.



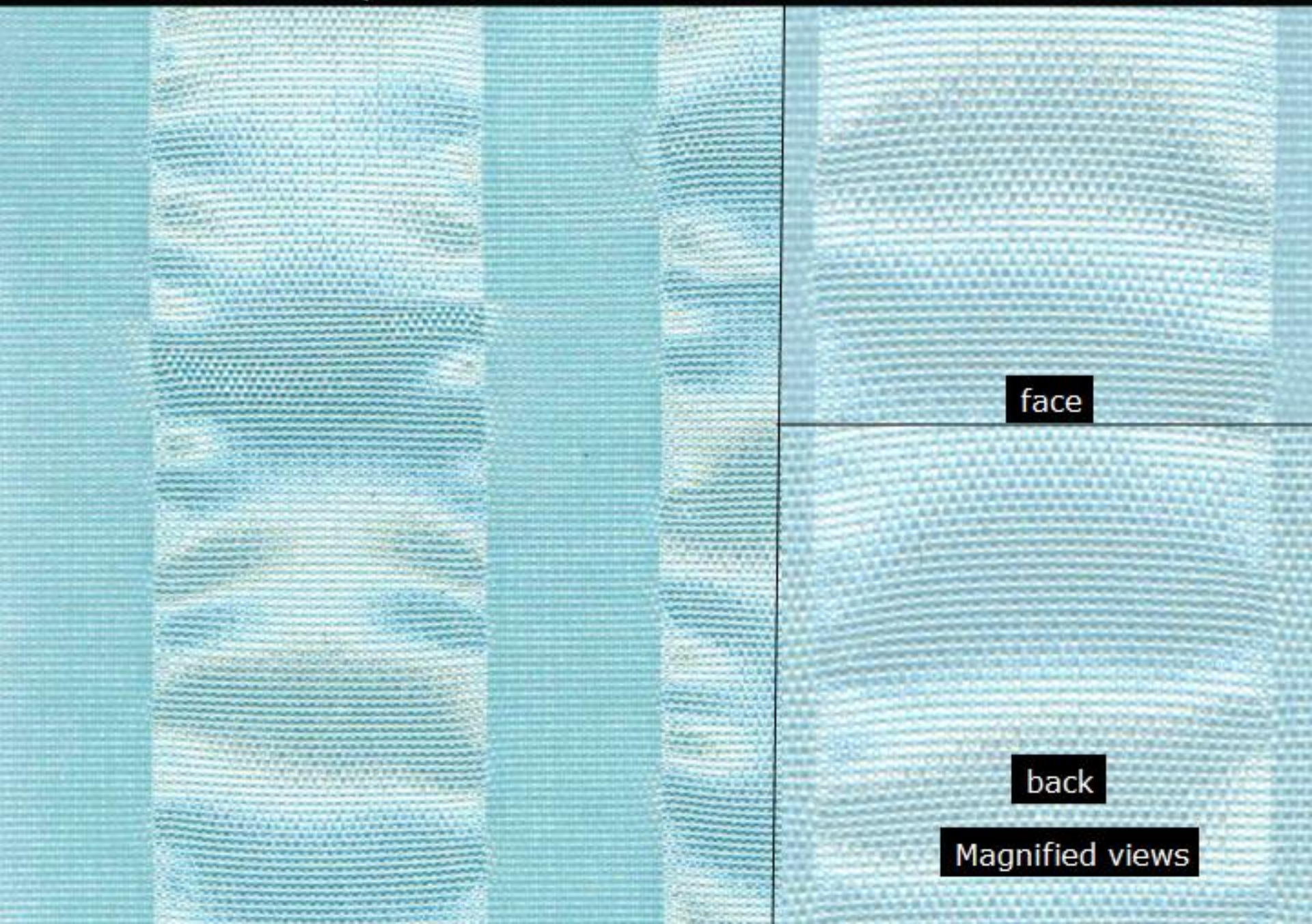
## Plissé

- **Plissé** fabric is produced by applying a chemical in vertical stripes that shrinks those areas of the material.
- Shrinkage creates a puckered look similar to that of seersucker fabric, but in a much less expensive manner than the slack tension weaving used in making seersucker.
- Sodium hydroxide or caustic soda paste is used to shrink cotton fabrics. Phenol is used to shrink nylon fabrics.





# Nylon Fabric with Plissé Finish





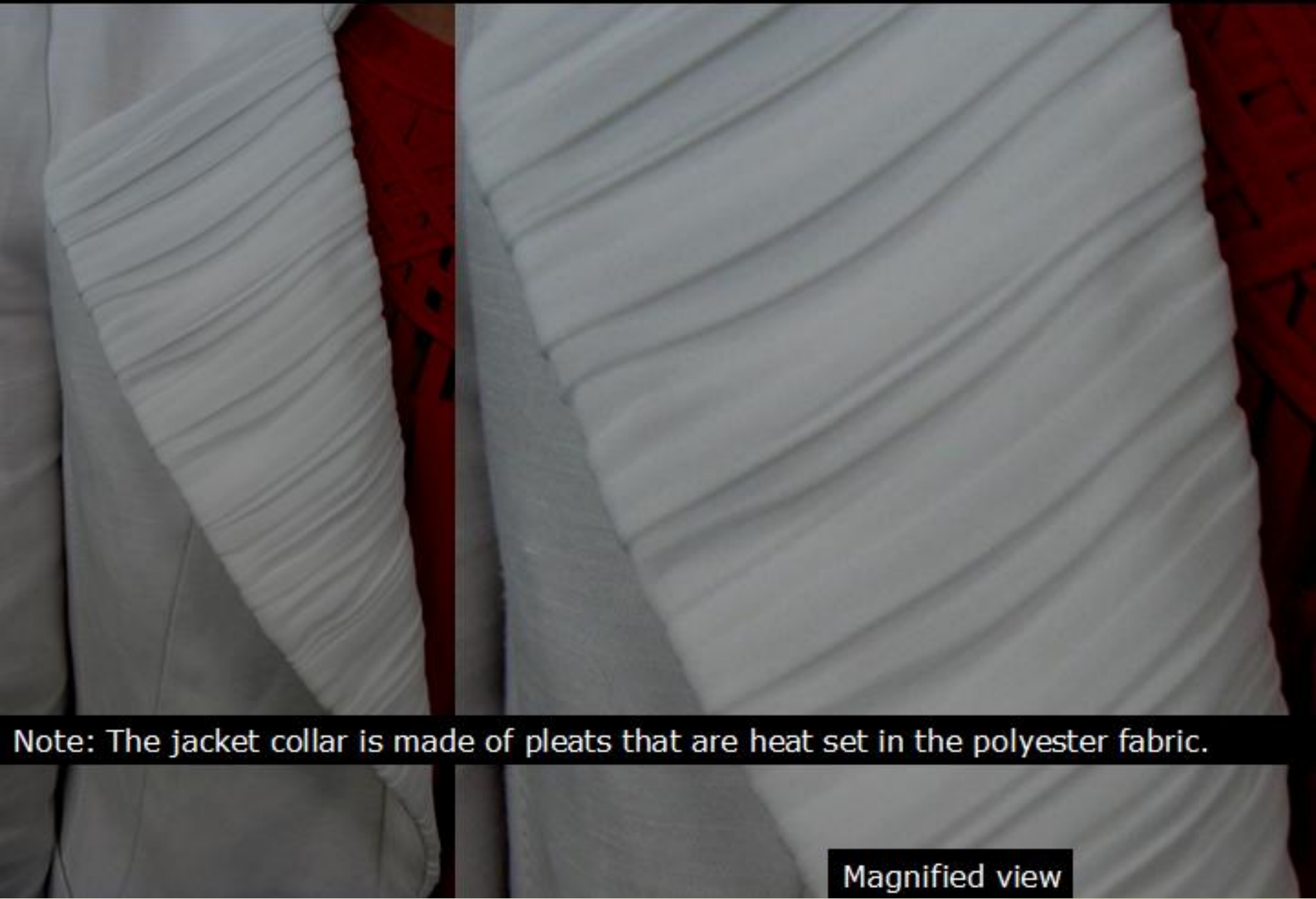


# Pleating

- **Pleating** is a mechanical finish combined with a thermal or chemical process to make the finish permanent.
- The size and shape of pleats range from simple knife or box pleats to novelty scalloped pleats to random pleated designs.
- The method for pleating depends on factors such as fabric, desired look and fiber content.
  - Thermoplastic fibers can be heat set to produce permanent pleats. Acetate, a thermoplastic fiber, cannot be heat set.
  - Resin is used for cotton and cotton blends.



# Polyester Fabric with Heat Set Pleats



Note: The jacket collar is made of pleats that are heat set in the polyester fabric.

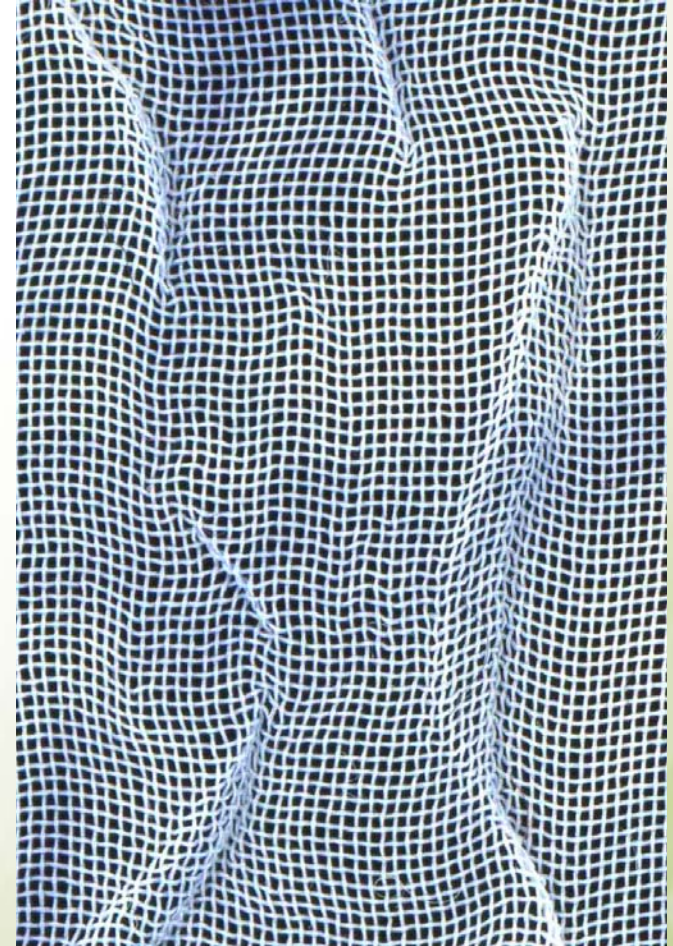
Magnified view





# Crinkling

- Crinkling is one method of producing fabrics with crinkled or crushed appearance.
  - Fabrics as well as finished products are crinkled.
- Different methods are used to mechanically distort the fabric to create the crinkled or crushed fabric appearance.
- Based on the fiber content, the fabric is typically either heat set or treated with resin and cured.



## Polyester Crinkled Blouse



Note: This is an example of thermal finish. The crinkled look has been achieved by heating the fabric past the glass transition temperature (temperature at which the fiber softens) while crinkling, and then cooling it so that it retains the shape. Garments with crinkled finish do not require ironing and are therefore good for travel.





## Stiffening Finishes

- **Stiffening finishes** include non-durable finishes such as starch and durable finishes such as acrylic emulsions.
  - Stiffening finishes are used for crinoline so it retains its stiffness after laundering.
  - Parchmentization of cellulosic fibers stiffens the fabric. Organdy is produced by parchmentization of lightweight, cotton fabric.





# Denim Finishing

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- **Denim finishing** includes several dry and wet processing techniques that give garments a used, worn, vintage, lived-in, or distressed look.
  - **Wet processing** techniques include rinsing (water washing), stone washing, chemical washing (acid wash, bleaching), tinting, and over dyeing. Enzymes may reduce the time required to achieve the desired look.
  - **Dry processing** techniques, or abrasive finishes, include hand sanding, sandblasting, brushing, destruction (holes, tears), laser burning, and laser discharge.
- Dry processes are applied to specific areas rather than a whole garment. Robotic machines are used for labor-intensive finishing techniques such as hand sanding.



# Original and Stone Washed, Indigo Dyed Denim



original

stone washed



# Chemical Wash of Denim Dyed with Sulfur Dye



Magnified view



# Denim Jeans - "Whiskered" look behind the knee



Note: "Whiskers" is a term used to describe abraded lines on jeans that simulate wear in the crotch area, behind the knees, and other parts of the jeans.



Magnified view