BÜFA

Neue Chemie.

Spotting Guide

Professional stain removal



Cleaning

Introduction

Professional stain removal (spotting) means cleaning high-quality textiles without damaging the fibres. Spotting protects the garment's value and is done as pre- or post-spotting before or after the actual
cleaning of the textile. The challenge is to use chemistry while respecting the fastness of dyes and fibres. Product knowledge,
process technology and chemical expertise are essential.

1. Basic chemical knowledge

a)
Surfactants

Surfactants are chemical compounds that reduce surface tension and are therefore used as washing-active substances.

Surfactants always consist of a hydrophobic part (water-repellent) and a hydrophilic part (water-attracting). This combination enables stains to be released from the textile.

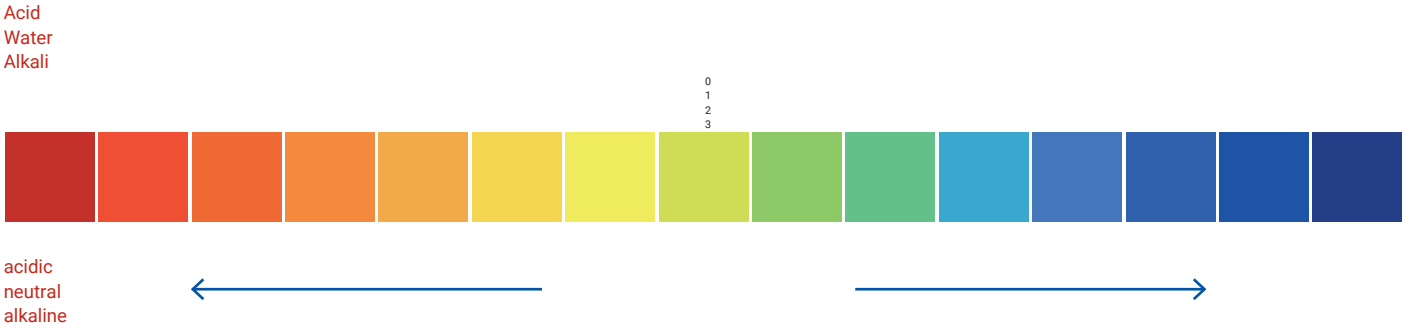
Surfactants are classified according to the charge properties of their hydrophilic part:

- anionic surfactants (negative charge)
- cationic surfactants (positive charge)
- non-ionic surfactants (no charge)
- amphoteric surfactants (positive and negative charges)

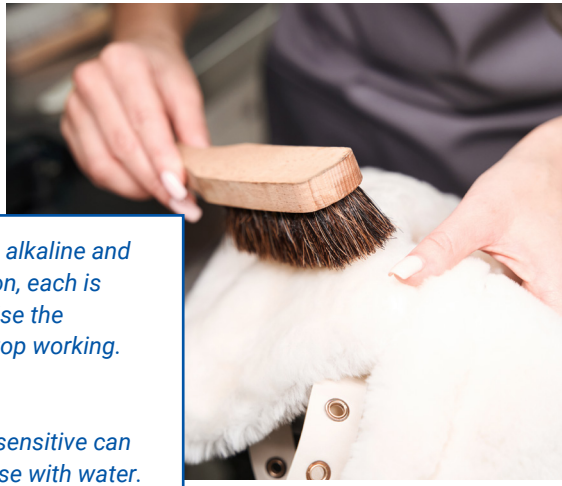
Only anionic surfactants are used in spotting and brushing agents, as they have the highest water-binding and soil-carrying capacity. Because they share the same negative charge as the textile, they repel each other and greying of the textile is prevented.

For this reason a cationic product with positive charge (e.g. cleaning booster) must never be used for brushing. Anionic cleaning boosters may also be unsuitable if they contain finishes or antistats that deposit on the goods and can cause greying.

b) pH values



The pH value (= describes the H+ concentration in an aqueous solution, oxonium) is expressed on a scale of 0–14 and indicates the strength of acidic and alkaline solutions.



During spotting, make sure that when alkaline and acidic products are used in succession, each is rinsed out after application — otherwise the products neutralise each other and stop working.

Fibres or dyes that are acid- or alkali-sensitive can also be neutralised this way. Then rinse with water.



2. Product knowledge

a) Fibre types

The following fibre types are distinguished:

Natural				
Plant **Seed fibre:** **Cotton**		Bast fibres: Flax, linen, hemp, jute, ramie	Leaf fibres: Manila, sisal	Fruit fibres: Kapok, coir
Animal	Sheep's wool: Merino, Crossbred, Cheviot	Camel hair: Camel, llama, alpaca, vicuña, guanaco	Goat hair: Mohair, cashmere, Tibet, angora rabbit	Silk: Mulberry, tussah
Mineral	Asbestos, glass fibres, metal fibres, carbon fibres			

Man-made	
Cellulose **Cupro, viscose, modal, acetate, triacetate**	
Synthetic	Polyamide (PA) Polyester (PES) Acrylic (PAC) Polyvinyl chloride (PVC) Polyurethane (PU) Polypropylene (PP) Elastane (EL)

b) Fibre identification

Fibres can be identified by visual/haptic assessment (look-and-feel test) or by a burn test.

For a burn test, carefully pluck fibres from the textile with the fingers and twist them into a thread. Then light with a gas lighter (a match alters the smell).

Fibre type Look-and-feel test Burn test		Flame Smell Residue		
Wool	Weak to strong lustre | Spring elasticity | Weak to strong crimp	Flickering, slow burning	Burnt horn or hair	Black crumbs, crushable
Cotton	Slightly lustrous to dull | Smooth, cool hand | uncrimped	Bright, fast burning Burnt paper Light white ash		
Silk	Raw and wild silk = dull and brittle to hard hand | Pure silk = noble lustre and soft, smooth, scroopy hand	Almost flameless; weighted silk (e.g. metal) flares up	Burnt horn or hair	Charry, crushable melt | weighted silk leaves a skeleton
Viscose	Hardly possible, as appearance of wool or silk is intended	Bright, fast burning to hissing Burnt paper White fly ash		
Acetate **Lustre, hand and crease behaviour similar to silk**		Almost flameless, melting Acetic Small, tough, dripping lump		
Acrylic	Hand similar to wool, but more brittle, low spring elasticity	Burns bubbling with soot pungent		Slag-like, hard, not fully crushable ash
Polyamide **Hand similar to silk, smooth lustrous surface**		Does not burn, but melts -- Glass-like, hard and not crushable		

c) Fibre properties

Wool
– Tends to felt; the finer, the more sensitive
– Felting risk rises with water, alkali,
temperature and mechanical action
– Neutral water (pH 7) is already perceived as alkaline
– pH is around 5, so it reacts least in weakly acidic solutions
– Can absorb up to 30% moisture from the air = felting risk
– At moist heat of 100 °C highly formable, so “shape pressing” is possible
– Above 60 °C with low moisture, damage to the wool occurs
– From 100 °C dry heat = loss of hygroscopically bound water = yellowing and heat creases

Cotton
– Resistant to mechanical action
– Wet strength increases when wet
– Sensitive to acid and insensitive to alkalis
– Very sensitive to oxidative bleaches
(chlorine bleach) and less sensitive to reductive bleaches
– Largely resistant to temperature

Silk
– Similar to wool
– More sensitive to strong acids (with metal-
weighted silk destruction is possible) and more resistant to strong alkalis than wool
– Dyeings often have only limited wear fastness
– Extremely abrasion-sensitive; raised areas appear as lightening; better use a cloth instead of a brush
– Always do a seam test before spotting
– Moire effect has only limited water fastness, so many moire fabrics (= figured weave) cannot be wet-spotted
– Dark lustrous silk, due to poor colour fastness, should preferably not be spotted, only dry-cleaned or wet-cleaned

Viscose (regenerated cellulose)
– More sensitive to acid and less sensitive to alkalis
than cotton
– More sensitive to mechanical action than cotton
– Wet strength is viscose’s weakest point
– Sensitive to higher temperatures
– With bleaches the same rules apply as for cotton
– With linen-structure viscose there is a risk of lustre loss when spotting; if stain treatment is unavoidable, keep mechanical action very low and dry the treated area
– Wet strength of viscose is low
– Higher temperatures during spotting should be avoided

Acetate
– Solubility test is possible, as fibres dissolve in acetone
– Unstable to solvent spotting agents containing ketones such as acetone
– Sensitive to acids and alkalis
– Surface structure changes under the combined action of moisture and heat
– Less sensitive to oxidative bleaches than viscose or cotton
– Extreme caution with all spotting agents: always do a seam test
– From 100 °C be careful with the steam gun
– Iron not above 120 °C and without pressure
– Acetate dyeings are also unstable to perfumes and deos; damage from these cannot be removed afterwards

Acrylic fibre
– Largely insensitive to spotting agents
– Thermoplastic fibre, i.e. moist heat causes permanent fibre deformation
– Do not use a steam gun when spotting
– During drying do not exceed 50 °C

Polyamide fibre
– Largely insensitive to spotting agents
– Dissolves in inorganic acids; caution with rust removers
– Thermoplastic, so strong heat causes deformation (burn holes from ash!)
– Keep sufficient distance with the steam gun

Llama, cashmere, mohair, alpaca etc.
– Comparable to sheep's wool
– Moisture greatly increases the risk of felting

Flax or linen, cupro, modal
– Comparable to cotton.

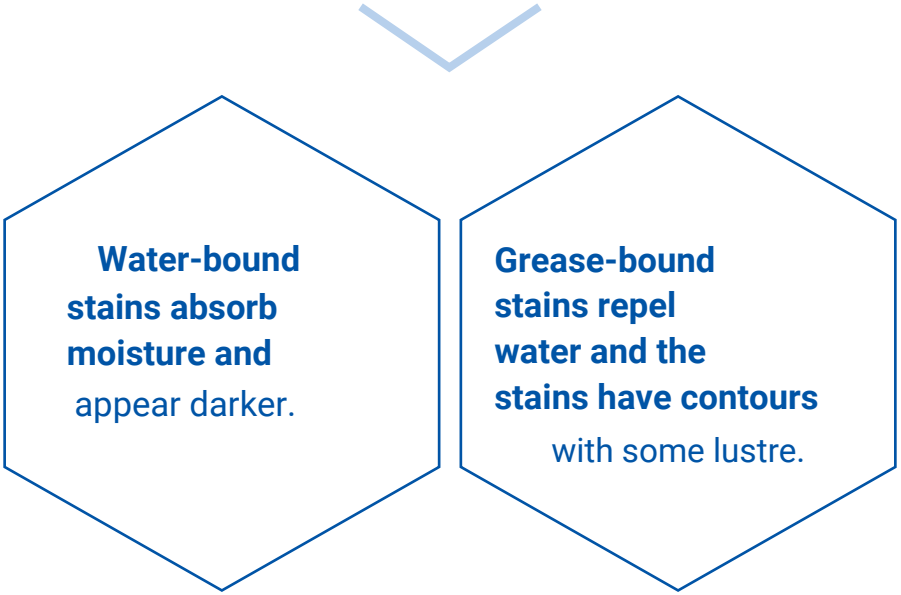
Polyester
– No impairment when spotting
– But caution with the steam gun; high temperatures can cause fibre changes



3. Stain identification

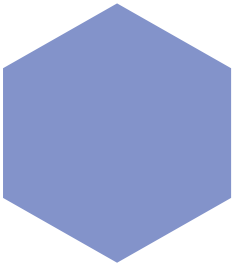
a) General

First, examine the textile.
Lightly misting with clear water
makes stain identification easier:

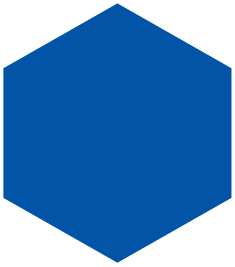


Stains that are pre-treated or already removed before cleaning or washing can no longer be fixed by the heat during drying.

Further distinguishing features:



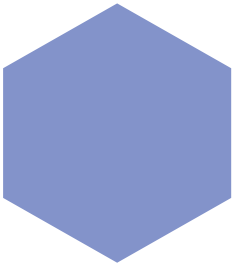
Edge shape: Sharp dark edges: blood, protein, starch, lacquer, tar, oil paint and adhesive



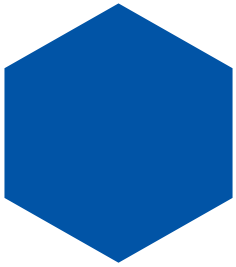
Hard feel: lacquers, oil paints and adhesives
Stiff feel: blood, protein and starch



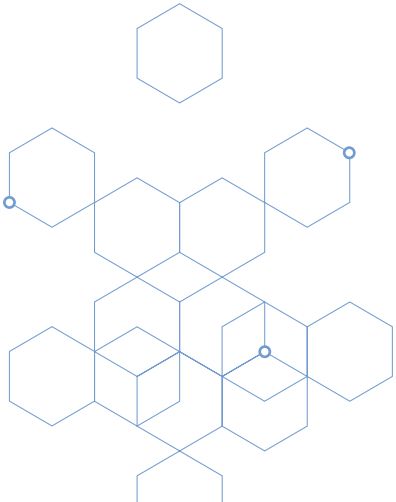
Colour:
– Yellow / brown
stains: tannin, coffee, tea, rust, tobacco juice, sugar, urine, mustard, perfume and blood
– Blue stains: ink, ballpoint, India ink, paint and berries
– Green stains: dye-stuffs, ballpoint, ink, grass and India ink
– Red stains: ink, ballpoint, lipstick, nail polish, India ink, blood, red wine
– Black or grey
stains: tar, road dirt, graphite, fly dirt, grease and India ink



Smell: If still perceptible, then typical of sweat, perfume, urine



Location: Position on the textile (e.g. sweat rings, urine stains)



b)
Classification

The number and type of stains is almost unlimited. Grouping is still possible, though stains may cross groups (e.g. coffee with milk and sugar), so both alkaline and acidic spotting agents may be needed.

A)
Starch- and sugar-containing stains
Two sugar types differ somewhat in chemical structure and properties:

– Monosaccharides (simple sugars) e.g. fruit and glucose
– Disaccharides (double sugars) e.g. cane sugar, beet and malt sugar
– Heat above 100 °C causes yellow and brown colouring (caramelisation).
– Monosaccharides can react chemically with protein fibres (wool, silk, animal hair, skin) and yellow to brown compound forms (melanoidin stains), favoured by ageing and heat from 50 °C, and sometimes cannot be fully removed.

Starch
– e.g. cereal, potato and rice starch
– Starch is a plant product in many foods. Partly water-soluble, partly swellable in water.
– Starch stains usually cause no difficulty when spotting.

In exceptional cases enzymes must be used to break down stubborn starch into sugar.

Stain removal > generally before cleaning with alkaline spotting agents such as Benzafix B or SpotX Blood. Acidic spotting agents and heat (steam gun) fix the stains.

B)
Protein stains
e.g. food residue, blood, milk, egg

– Protein may be plant or animal and is present in many foods. When fresh, protein is water-soluble and washable.
– Protein stains coagulate after 72 hours or also through acid or heat above 40 °C.
– Old, coagulated protein stains must be broken down with enzymes.
– The iron content of blood can oxidise in old stains. Treat first with a blood remover, then remove remaining iron with a rust remover (rinse alkaline blood remover first).

Stain removal > alkaline spotting agents such as Benzafix B, SpotX Blood or Oldozym AP. For blood also SpotX Rust.

C)
Tannin or tannin-containing stains
e.g. coffee, tea, wine, fruit juices, ice cream

– Tannin is a compound that can convert animal skin into leather (tanning). In this process tannin reacts chemically with skin protein.
– Tannin stains are often hard to recognise when fresh. Heat, strong alkalis and ageing turn them yellowish brown and fix them on wool, silk and hair (protein fibres).
– To improve spotting, use some heat (steam gun). Fixed stains can be removed by bleaching with sodium percarbonate.

Stain removal > acidic spotting agents such as Benzafix C or SpotX Tan

D) Grease and paint stains e.g. tar, oil and lacquer paints

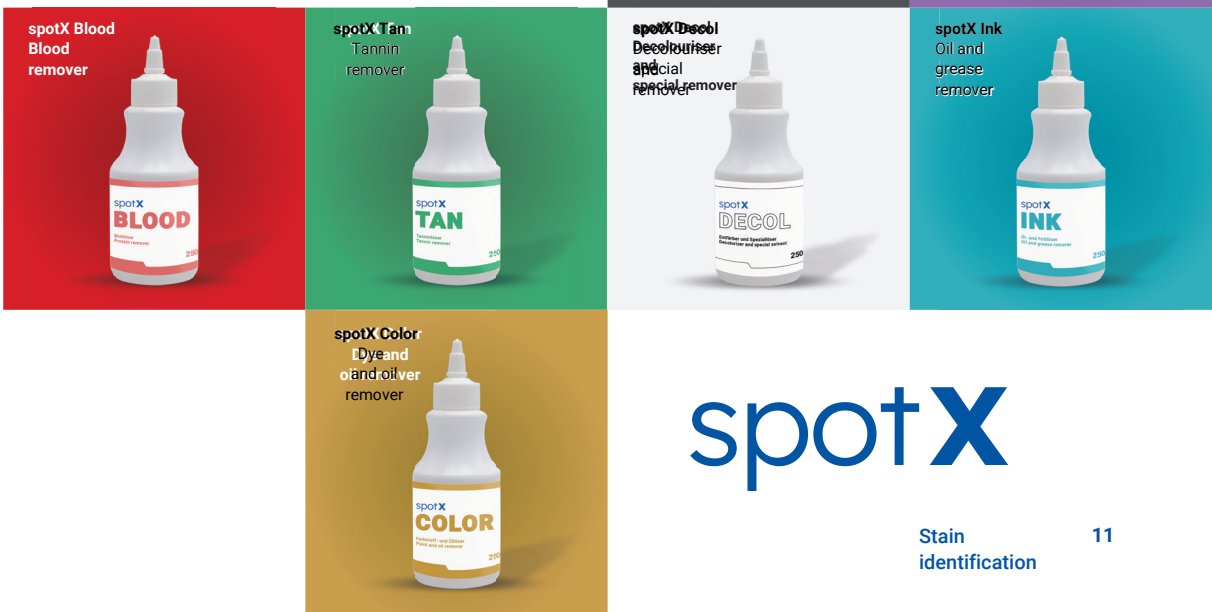
– Stains in this group are water-insoluble and can only be dissolved in solvents.
– Pre-spotting is advisable here too, otherwise the metal abrasion in grease (pigment soil) is fixed on the goods. Metal abrasion left after pre-spotting can be treated with rust remover.
– With oil and lacquer stains, cleaning would only remove the pigments; dyes stay fixed on the goods. Dye residues can then only be removed by bleaching.
– Water-based lacquers that are fully polymerised after the water evaporates can no longer be removed with a spotting agent.
– When spotting paint stains, blot or rinse them with a cloth. Keep enough distance with the steam gun so heat does not fix the colour pigments.

Stain removal > spotted with agents containing organic solvents such as Benzafix A, SpotX Ink or SpotX Color. SpotX Resin can also be used as a pure post-spotting agent. With the steam gun avoid excessive heat (keep enough distance).

E) Chemical and oxide stains e.g. rust, medicines

– Removing these stains needs time (chemical reaction between stain and spotting agent over time) and no mechanical action.

Stain removal > Rust stains are removed with strongly acidic spotting agents such as SpotX Rust. Discolourations or medicine stains can be removed with SpotX Decol.



spotX

c) Removal

Important basic rules for stain removal:

- If alkaline and acidic spotting agents are used in succession, rinse the first so their effects do not cancel each other. This does not apply to dry spotting agents.
- Do not leave pre-spotted textiles lying for more than 20 min. Spot very sensitive textiles last so they can go straight into the machine afterwards.
- Fold pre-spotted damp areas inward so they contact other garments as little as possible.
- Stains of unknown origin should never first be treated with hot steam or acidic spotting agents, due to possible fixing.
- On critical textiles or dyeings always do a seam test.
- The spotter should do their best to remove the stain but always avoid damaging the goods

Dissolvin

Dissolving a stain follows the principle: like dissolves like!

A stain once dissolved in water will dissolve again with suitable aqueous spotting agents.
– e.g. sugar dissolves with aqueous SpotX Blood, but not with solvent-based SpotX Resin.
A stain once dissolved in organic solvents will dissolve again with suitable organic spotting agents.
– e.g. all-purpose adhesive dissolves in SpotX Resin, but not in SpotX Tan.
A water-bound stain (e.g. beer) can only be removed by treatment with water (moisture) + brushing agent during textile cleaning.

Softening

Softening is needed when the stain is hard and sits on the surface. Soften with a brushing agent such as Devantol Super or a spotting agent, depending on stain type.

– e.g. tar > Benzafix A or SpotX Ink
– e.g. blood > Benzafix B or SpotX Blood

Softening coats insoluble stain components (e.g. carbon pigments) so they can be released.

Mechanical action
Mechanical action on the stain serves to break up and remove the stain substance.

Mechanical treatment uses spotting brushes and spatulas. It breaks up stain substances so chemicals can work better.

Breakdown by enzymes
Enzyme treatment is used on stubborn starch and protein stains.

Moisten the stain and apply concentrated Oldozym AP. After about 1 hour dwell time rinse with cold water. Follow with mechanical treatment.

Alternatively soak the whole textile in warm water (approx. 35 °C) with Oldozym AP for several hours. Then rinse well by hand and dry. Always wear gloves with enzyme products. Acids and alkalis interfere.

Chemical conversion
Chemical conversion of stains (time reaction) e.g. with SpotX Rust = strong acid. If colours shift, neutralise immediately with an alkaline product, e.g. SpotX Blood.

Procedure for stains of unknown origin
Benzafix A, SpotX Ink or SpotX Resin (dry spotting agents)
– rinse cold or allow to evaporate
(for wettability or butyl acetate).

Benzafix B or SpotX Blood (alkaline spotting agents)
– treat cold, then rinse with cold water
and neutralise.

Benzafix C or SpotX Tan (acidic spotting agents)
– time reaction that can be accelerated by heating with the steam gun

SpotX Rust (strongly acidic spotting agent)
– Chemical reaction needing time and no mechanical actionHeating with the steam gun can accelerate the reaction. Then neutralise.

If needed, bleach with an oxidising agent (e.g. sodium percarbonate) or SpotX Decol (mild reducing agent).

Notes
For yellowing, treat the textile with an optical brightener or a bleach. Sweat or perfume in deodorants can damage dyeings. These rings can no longer be removed.

Procedure for colour transfer
– Washable textiles with 2–4 ml Reoxal / l bath in thprewash at 30–60 °C.

4. Use of bleaching agents

a) General:

Bleaches can be an effective tool for removing stains. Use them only after limited success with conventional spotting agents. Sometimes spotting only lightens a stain without fully removing it — then continue with bleach.

Bleaches do not remove stain substance; they make the stain invisible by oxidising it (adding oxygen) or reducing it (removing oxygen). Conventional spotting agents are often safer for fabric and dyeing than bleaches, so bleaches should only be a last resort.

b) Types:

There are two types of bleaching agents:

- Oxidising agents work best on organic stains
  e.g. food residue, grass, fruit, wine, body secretions etc.

- Reducing agents work very well on dye stains.



c) Precautions:

First test the textile dyeing for colour fastness. Use an overhanging piece of the seam. All colours that contact the bleach must be tested for fastness.

Also rinse the area to be treated with water before applying bleach, in order to
– remove residues of spotting agents
– ensure a pH-neutral state of the fabric
– break surface tension so the bleach can penetrate deeply.

Place a towel under the treatment area. Do not let bleach contact metal, to avoid colour change.

Always apply bleach only with a pipette or a working bottle with a suitable dropper closure.

Bleach pH Risk to Application			
Sodium dithionite weakly alkaline		Wool, silk, Spandex (Lycra), nylon, some dyeings	Dilute 1:10 with water; after use rinse with antichlor (sodium thiosulphate)
		Sodium bisulphite acidic some dyeings 1 teaspoon per 100 ml	
Sodium percarbonate alkaline		some dyeings, fabrics with optical brighteners, wool, silk 1 teaspoon per 100 ml, heat the stain area	
Hydrogen peroxide acidic some dyeings 3%			
Sodium hypochlorite alkaline some dyeings, metallic fabrics			Dilute 1:10 with water; after use rinse with antichlor (sodium thiosulphate) and do not use acidic products (risk of chlorine gas!)

BÜFA

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BÜFA Cleaning GmbH & Co. KG
August-Hanken-Str. 30
26125 Oldenburg | Germany

cleaning@buefa.de
buefa-cleaning.com