

Stain removers for household use



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Stain removers are substances designed to remove tough stains from various surfaces, including clothes, carpets, upholstery. Stain removers available on the market can be divided into stain removers designed for colored fabrics, black fabrics, white fabrics. The most common methods of applying the product are as a laundry additive to enhance the action of the laundry detergent or directly on the stain, in the case of difficult, single stains.

The developed formulation is shown below:

- Liquid Stain Remover, LSR
- Pre-Treat Gel Stain Remover
- Concentrated Gel Stain Remover, CGSR

Detergency

Detergency - the ability of the detergent to remove soils from the fabric surface during the laundering process. Detergency tests were performed using to own method on fabric soiled with standard, different dirt:

1. Fluid make-up, 2. Curry, 3. Blood, aged, 4. Wine, aged, 5. Spaghetti sauce with beef, 6. Chocolate ice cream, aged, 7. Grass/mud, with thickening agent, 8. Highly discriminative tea, 9. Grass, pure, 10. Baby food carrot/potato, 11. Standard clay, 12. Beta-carotene on cotton, circular stain, 13. Dirty Motor Oil (DMO), 14. Butterfat with colourant, 15. Beef fat, coloured with Sudan Red.

Tested dirt divided into three categories:

Enzymatic

- Blood, aged
- Chocolate ice cream, aged
- Beef fat, coloured with Sudan Red
- Dirty Motor Oil (DMO)

Bleachable

- Curry
- Wine, aged
- Grass/mud, with thickening agent
- Highly discriminative tea
- Grass, pure
- Standard clay
- Beta-carotene on cotton, circular stain
- Baby food carrot/potato

Greasy

- Fluid make-up
- Spaghetti sauce with beef
- Butter with colourant

Test conditions:

- automatic washing machine
- 40°C
- water hardness (13 °dH)
- cotton program
- load – 2.5 kg of dry, white towels
 - LSR – 40 mL/kg clothes + washing capsule
 - CGSR – 40 mL/kg clothes + washing capsule
 - pre-treat gel stain remover – applied before washing (squeeze on stains, rub in circles and leave for 5 minutes) + washing capsule
- fabric soiled with standard dirt

After the washing process was performed, the standardly soiled fabrics were dried and then the degree of washing was assessed by measuring parameter dE^* from the CIELab scale, as the difference between the initially stain and the degree of its washing.

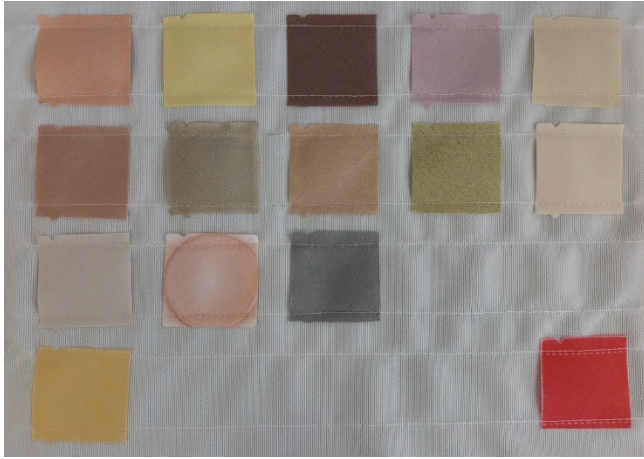


Figure 1. Soiled fabric before washing

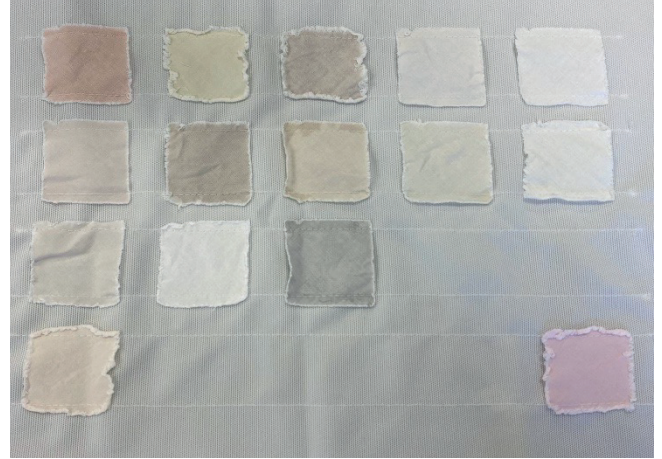


Figure 2. Fabric after washing



Liquid stain remover, LSR/1

Compound	Brand name	Concentration [%]	Function
PEG-6 Glyceryl Cocoate/ Laureth-7/ PEG 11-Rapeseedamide	ROKAcet KO400G/ ROKAnol L7/ ROKAmid MRZ11	11.0	Breaks down stains
Sodium Dodecylbenzenesulfonate	ABSNa 50	7.7	Removes stains/ foaming agent
Hydrogen Peroxide	–	30.0	Bleaching agent
Etidronic Acid	–	4.0	Stabiliser
Sodium Hydroxide	–	for pH ~ 4.5	pH regulator
Aqua	–	up to 100.0	Solvent

APPEARANCE	visual method	clear liquid
pH		4
VISCOSITY [cP]	Brookfield LV, T: 20°C	100-150
STABILITY	1 month in 5°C, 20°C, 40°C	confirmed



PROCEDURE

1. Mix ABSNa 50 with water.
2. Add ROKAcet KO400G/ ROKAnol L7/ ROKAmid MRZ11 and mix until a homogeneous solution is obtained.
3. Then add Editronic Acid and mix.
4. Add Sodium Hydroxide to obtained pH around 4.5.
5. Then add Hydrogen Peroxide and until a clear liquid is obtained.

It is possible to make the same formulation with pH around 6. For this purpose, add appropriate amount of Sodium Hydroxide.

Liquid stain remover, LSR/2

Compound	Brand name	Concentration [%]	Function
C12-16 Laureth-7/ PEG 11-Rapeseedamide	ROKAnol L7A/ ROKAmid MRZ11	9.0	Breaks down stains
Sodium Dodecylbenzenesulfonate	ABSNa 50	8.0	Removes stains/ foaming agent
Sodium Polyacrylate	EXOlat ZA	5.0	Sequestrant
C12-15 Pareth-3	ROKAnol DB3	1.0	Removes stains/rheology modifier
Hydrogen Peroxide	–	30.0	Bleaching agent
Aqua	–	up to 100.0	Solvent

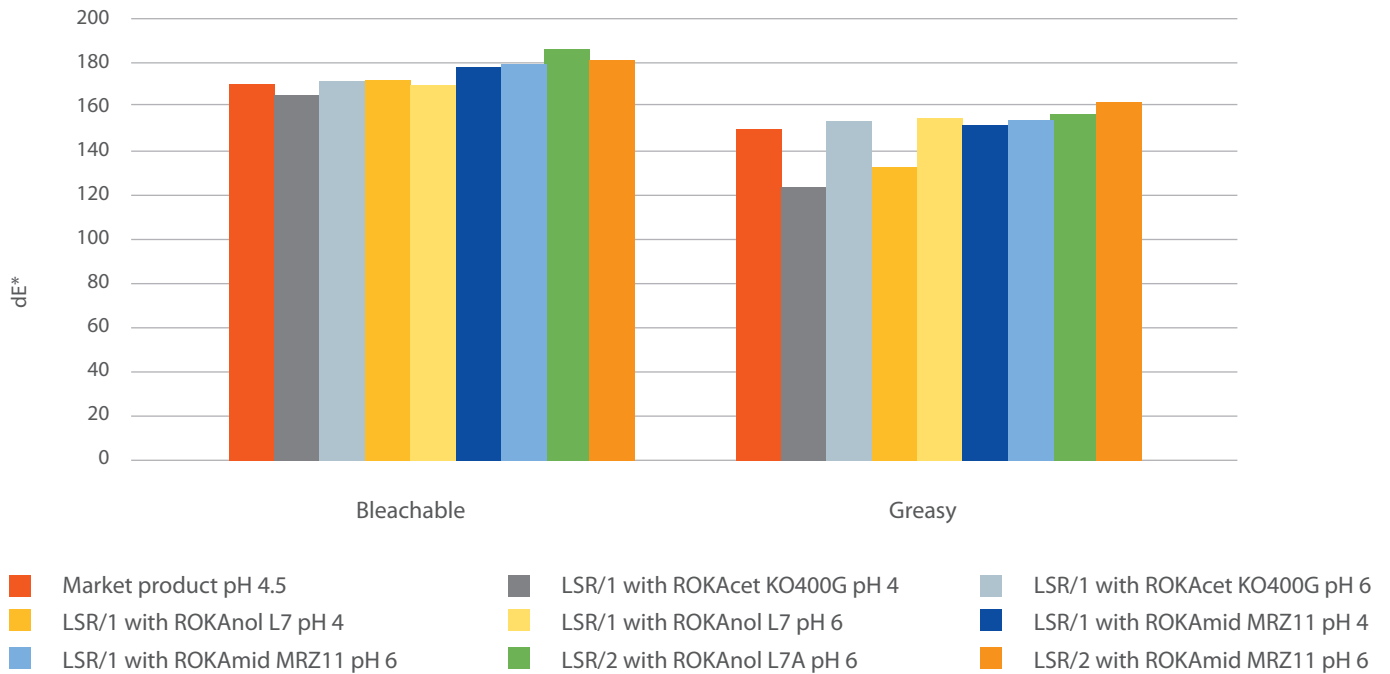
APPEARANCE	visual method	clear liquid
pH		6
VISCOSITY [cP]	Brookfield LV, T: 20°C	200-400



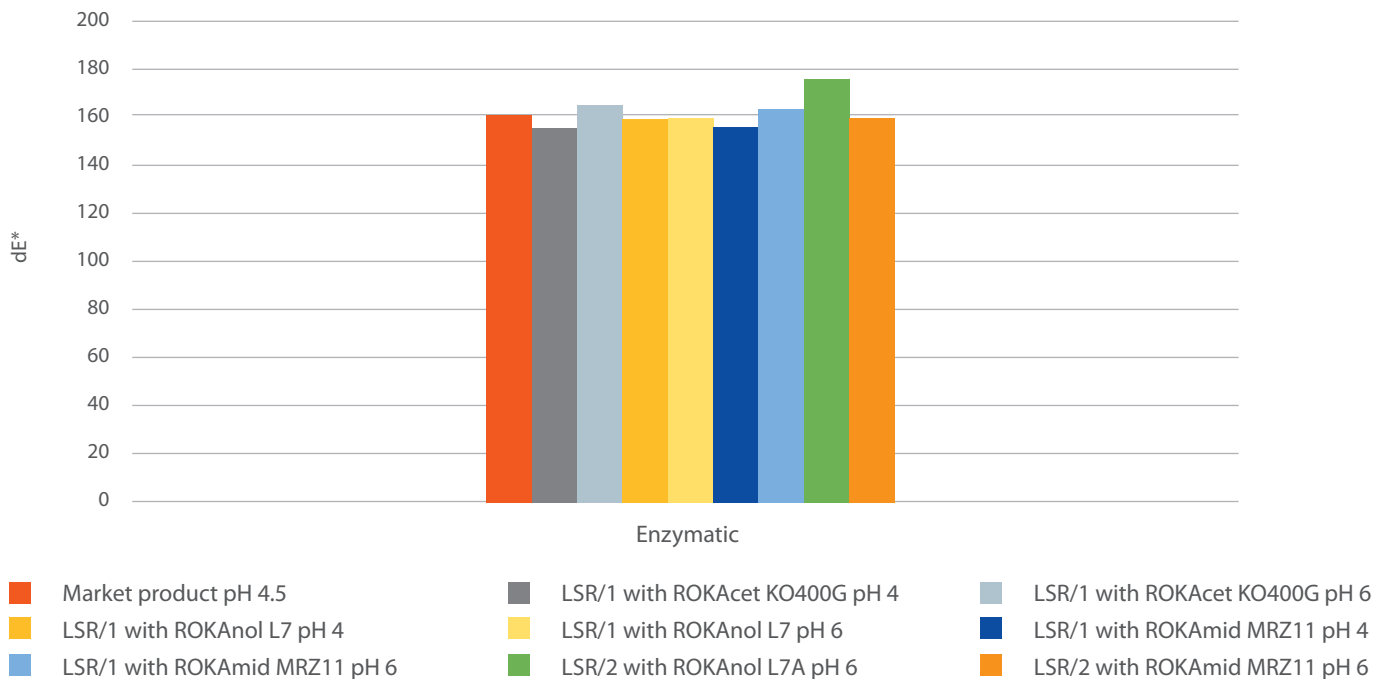
PROCEDURE

1. Mix ABSNa 50 with water.
2. Add ROKAnol L7A/ ROKAmid MRZ11 and mix until a homogeneous solution is obtained.
3. Then add EXOlat ZA and mix.
4. Add ROKAnol DB3 and mix.
5. Then add Hydrogen Peroxide and mix.

Liquid stain removers for bleachable and greasy stains
(40 mL/kg clothes + washing capsule)



Liquid stain removers for enzymatic stains
(40 mL/kg clothes + washing capsule)



Parameter dE* is the difference between the initial stain and the degree of its washing, higher dE*, better detergency.

Pre-treat gel stain remover

Compound	Brand name	Concentration [%]	Function
Sodium Dodecylbenzenesulfonate	ABSNa 50	7.7	Removes stains/ foaming agent
Laureth-3	ROKAnol LK3	6.0	Removes stains/ rheology modifier
Laureth-7/ PEG 11-Rapeseedamide	ROKAnol L7/ ROKAmid MRZ11	4.0	Breaks down stains
Hydrogen Peroxide	–	13.0	Bleaching agent
Sodium Hydroxide	–	for pH 6	pH regulator
Aqua	–	up to 100.0	Solvent

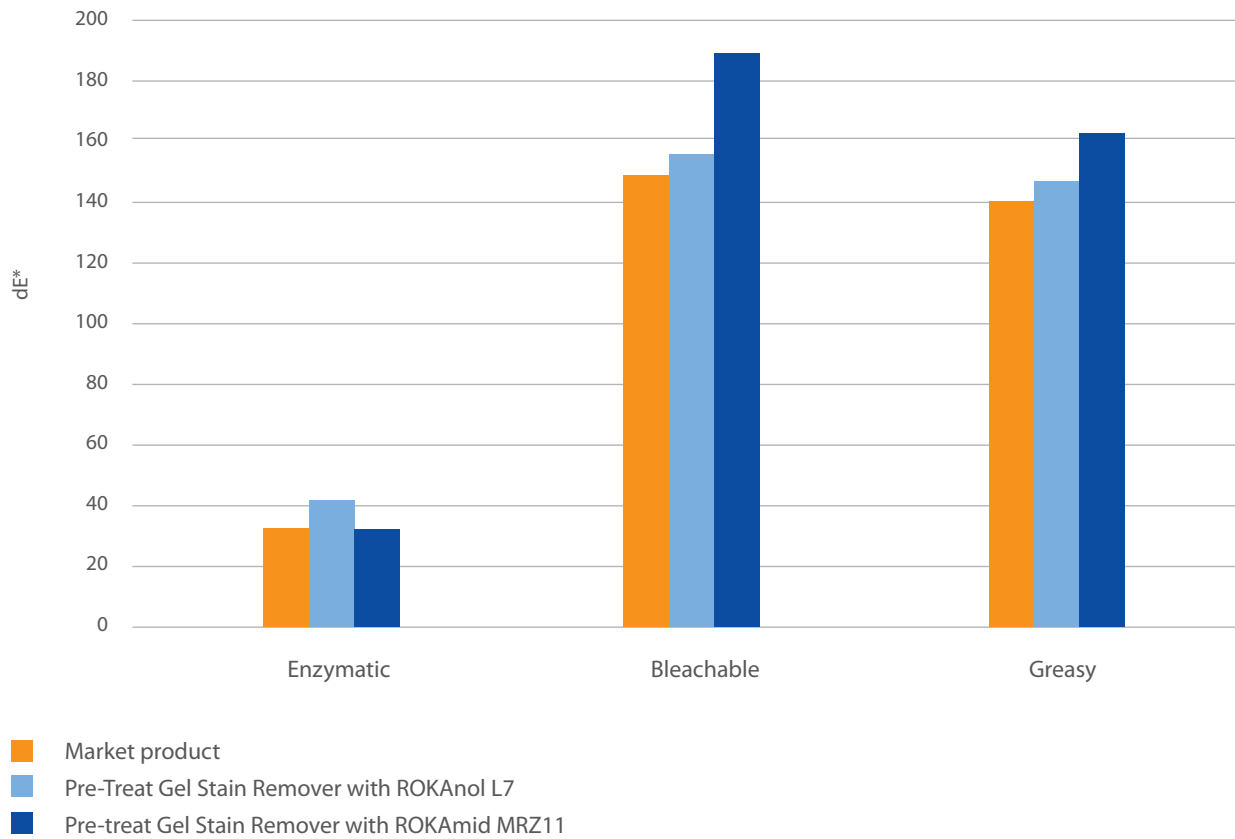
APPEARANCE	visual method	liquid paste
pH		6
VISCOSITY [cP]	Brookfield LV, T: 20°C	1000-1400



PROCEDURE

1. Mix ABSNa 50 with water.
2. Add ROKAnol LK3 and mix.
3. Then ROKAnol L7/ROKAmid MRZ11 and mix.
4. Then add Hydrogen Peroxide and mix until homogeneous liquid paste is obtained.
5. Check the pH, add Sodium Hydroxide to obtain approximately 6.

Pre-treat gel stain removers



Parameter dE* is the difference between the initial stain and the degree of its washing, higher dE*, better detergency.



Concentrated gel stain remover, CGSR/1

Compound	Brand name	Concentration [%]	Function
Sodium Laureth Sulfate	SULFOROKAnol L170/1	6.0	Removes stains/ foaming agent
C12-16 Laureth-7/ PEG 11-Rapeseedamide	ROKAnol L7A/ ROKAmid MRZ11	7.0	Breaks down stains
C12-15 Pareth-3	ROKAnol DB3	3.0	Breaks down stains/ rheology modifier
Hydrogen Peroxide	–	30.0	Bleaching agent
Disodium Edetate	–	5.0	Chelator and stabiliser
Citric Acid	–	for pH 6	pH regulator
Aqua	–	up to 100.0	Solvent

APPEARANCE	visual method	liquid paste
pH		6
VISCOSITY [cP]	Brookfield LV, T: 20°C	1200-1400



PROCEDURE

1. Mix SULFOROKAnol L170/1 with water until dissolved.
2. Add ROKAnol L7A/ROKAmid MRZ11 and mix.
3. Then add ROKAnol DB3 and mix.
4. Add Disodium Edetate and mix.
5. Then add Hydrogen Peroxide and mix.
6. Check the pH in the mass, add citric acid to obtained approximately 6.

Concentrated gel stain remover, CGSR/2

Compound	Brand name	Concentration [%]	Function
C12-16 Laureth-7/ PEG 11-Rapeseedamide	ROKAnol L7A/ ROKAmid MRZ11	7.0	Breaks down stains
Sodium Laureth Sulfate	SULFOROKAnol L270/1	6.0	Removes stains/ foaming agent
Sodium Polyacrylate	EXOlat ZA	5.0	Sequestrant
C12-15 Pareth-3	ROKAnol DB3	3.0	Breaks down stains/ heology modifier
Hydrogen Peroxide	–	30.0	Bleaching agent
Disodium Edetate	–	5.0	Chelator and stabiliser
Aqua	–	up to 100.0	Solvent

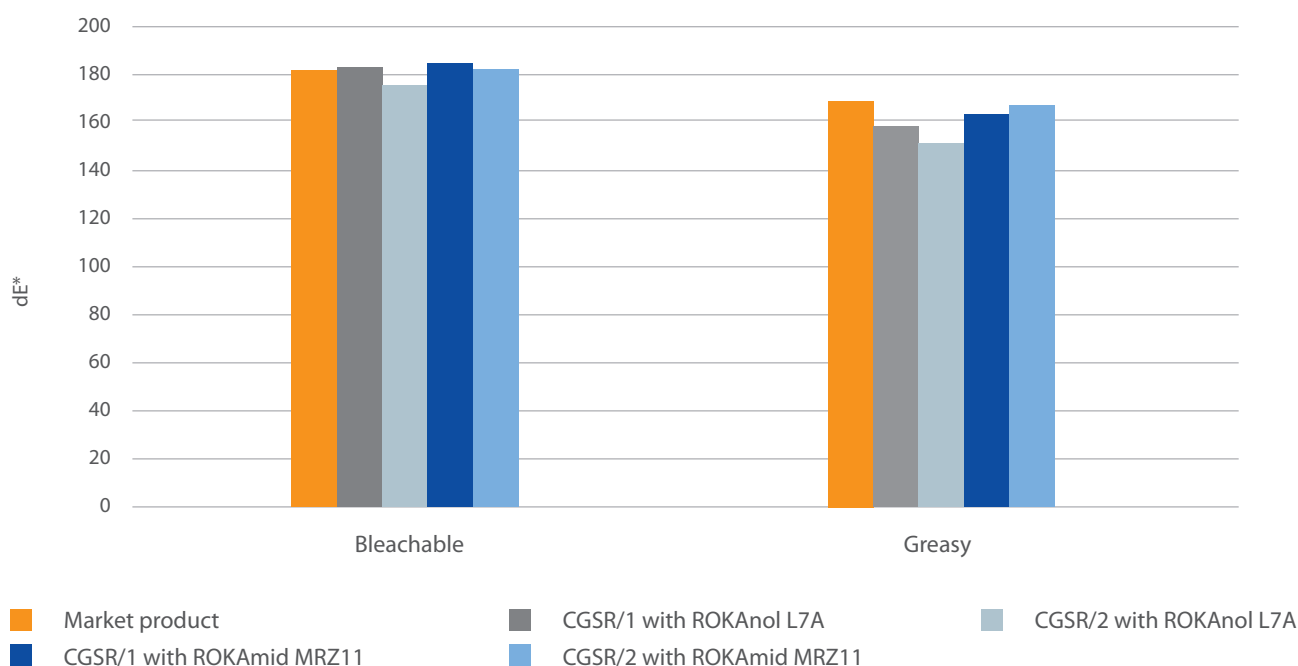
APPEARANCE	visual method	liquid paste
pH		6
VISCOSITY [cP]	Brookfield LV, T: 20°C	900-1200



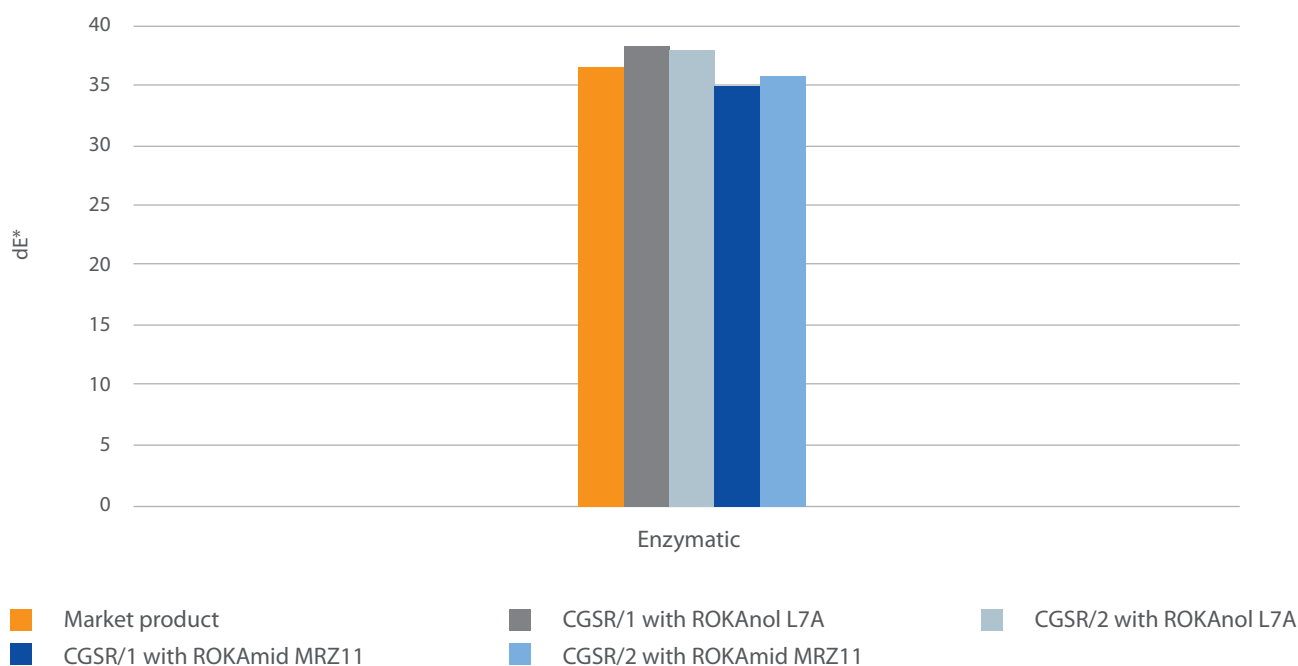
PROCEDURE

1. Mix SULFOROKAnol L270/1 with water until dissolved.
2. Add ROKAnol L7A/ROKAmid MRZ11 and mix.
3. Then add ROKAnol DB3 and mix.
4. Add EXOlat ZA and mix.
5. Add Disodium Edetate and mix.
6. Then add Hydrogen Peroxide and mix.

Concentrated gel stain removers,
40 mL/kg clothes + washing capsule



Concentrated gel stain removers,
40 mL/kg clothes + washing capsule



Parameter dE* is the difference between the initial stain and the degree of its washing, higher dE*, better detergency.

PCC EXOL SA

Sustainable technologies for new generations



PCC EXOL SA is a company that combines cutting-edge technologies with rich experience in production of surfactants (surface active agents). The company is located in Brzeg Dolny (Poland), where anionic, nonionic and amphoteric surfactant production plants have been launched. Due to the flexible production processes, the company offers a wide spectrum of surfactants and industrial formulations, which are often suited for the individual customers operating in plenty of various industry sectors. As one of the leading surfactant manufacturers, PCC EXOL SA carries out new investment projects and implements innovative technologies based on the global sustainability trends.

PCC EXOL SA portfolio includes surfactants with a broad range of applications. Besides of the mass production for personal care and detergents industry, the substances produced by PCC EXOL SA also include specialized products used in various branches, such as textile, agrochemical, metal cleaning, oil drilling, building & construction, paints & coatings, paper industry, extraction & drilling, and many others. The company comprehensive portfolio is continuously enriched with new innovative products, which meet even the strictest market requirements and adapt to the individual needs of customers. This is possible due to the dynamic development of the research facili-

A large background image featuring a repeating pattern of light blue and white hexagons. Overlaid on this pattern is a faint, glowing blue molecular structure with interconnected nodes and lines, suggesting a chemical or technological theme.

PCC EXOL SA combines innovative technologies with experience in designing, producing and selling surfactants and chemical formulations

ties, flexible production, knowledge as well as experienced personnel.

PCC EXOL SA has the key competence necessary for a worldwide production of surfactants. The ongoing projects will soon bring the new opportunities for the company's further development and expansion into new markets. The company offers not only a wide portfolio and professional servicing but most of all flexible production and comprehensive system solutions that meet individual customer demands. The strategic PCC EXOL SA investor is PCC SE, operating on international markets of the chemical raw materials, transport, energy, coal,

coke, petrol, plastics and metallurgy. PCC SE includes 80 companies operating in 39 different locations in 17 countries.



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