IKW Working Group »Cleaners for Glass Ceramic Cooking Fields«*

IKW Recommendation for the Quality Assessment of the Cleaning Performance of Cleaners for Glass Ceramic Cooking Fields

Developed by IKW member companies with the participation of the company Schott Glas, published by Industrieverband Körperpflege- und Waschmittel e.V. (IKW), 2004

Foreword

The IKW member companies share their expert knowledge of the products they manufacture with the general public in the form of quality recommendations. These recommendations are intended to facilitate qualified testing of products by the companies themselves, by consumers and test institutes. Quality standards are laid down and must be fulfilled by the given products to meet the expectations of consumers and manufacturers alike.

Companies affiliated to IKW strive for optimal quality standards for their products. Consistently pursuing the ideal of sustainability, they want to ensure their viability for the future in a constantly changing world.

This commitment to sustainability is based on experiences expressed in several exemplary initiatives. Proceeding from the Rio declaration of 1992, Johannesburg »92 plus 10« and the Agenda 21, a well-balanced combination of economic, social and ecological aspects has been found, enabling the fulfillment of the needs of the present without compromising the ability of future generations to meet their own needs.

Against this backdrop, the »Recommendations for Quality Assessment« serve to encourage company staff to act responsibly towards mankind and the environment in the development and manufacture of products and also help meet the expectations of consumers in terms of efficacy, safety and environmentally compatible products. Quality standards determine what qualities are relevant to a given product and to what extent these qualities must be present. It should be noted that each finished product has a certain spectrum of effects largely oriented to consumer expectations for each individual quality characteristic, so that in every product some characteristics are deliberately emphasized whilst others will be less important. Moreover, the desired combination of individual product characteristics is subject to constant change, depending on the latest technical possibilities and new consumer habits. Quality recommendations must not impair such developments. Consequently, only one overall result indicating whether or not a product meets quality requirements can be obtained for each product. Emphasis on isolated test criteria is inadmissible and may be misleading.

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CLEANERS FOR GLASS CERAMIC COOKING FIELDS

1. Introduction

Glass ceramic cooking fields are commonly found in modern households. Special cleaning products are frequently used for these high-quality surfaces. Cleaning performance and material friendliness are of major importance to their suitability for the intended purpose. These cleaners are preparations of various surfactant mixtures and abrasives; furthermore, they contain additives such as fragrances and colorants as well as auxiliaries, e.g. for viscosity adjustment. Ecological aspects are also taken into account in this product group by developing concentrated and innovative formulations. Today, the market for glass ceramic cooking fields comprises a wide range of products with different requirement profiles, including special formulations to achieve specific claims/product properties.

Both users and suppliers of these products wish to have reliable and practice-oriented test methods for a quality assessment, particularly with regard to the cleaning performance, without, however, replacing or putting into question established and protected quality marks of manufacturers of glass ceramic cooking fields.

A working group of company experts from the cleaning products industry was set up within IKW to develop such a method. In questions relating to the assessment of the material friendliness of cleaners, the working group secured the necessary expertise through the participation of the leading manufacturer of glass ceramic cooking surfaces in Europe (1).

2. Aim

The mandate of the working group was to develop an IKW recommendation for the quality assessment of the cleaning performance of glass ceramic cooking fields, taking into account at least sufficient material friendliness. The recommendation is intended to enable qualified testing by the manufacturers themselves or by independent test institutes. It may also serve as a contribution to discussions about test methods for glass ceramic cooking surfaces at European level and must meet the following criteria:

- straightforward, without sophisticated equipment
- relevant to practical applications
- reproducible
- differentiated

3. Strategy of the working group

After compiling and comparing methods used by manufacturers to assess the cleaning performance, the in-house method of one manufacturer was selected as a starting point for joint development work. This method was revised in many aspects, described more precisely, modified and reviewed in numerous ring tests. This IKW Recommendation for quality assessment as presented here was coordinated with leading European test institutes.

4. Cleaning performance with burnt foods

4.1 Test principle

In this test method, soiling types consisting of foodstuffs – as they are commonly found in households – are used, and the boiling over and spillage of foodstuffs in their preparation are simulated. In such situations, a burn-in temperature of ca. 200 °C is typical for the area immediately next to the marked heated surface.

The various soiling types **(Table 1)** are spread in an equal layer on a glass ceramic cooking field and burnt in at high temperatures in a warming cabinet. The preparation of the test fields is the crucial part of this method and therefore requires special attention. The comparative assessment of the cleaning performance is made by wiping with a sponge onto which the test substance has been applied, using an automatic wiper. After the same number of wiping processes, the cleaning performance achieved is determined by assessment. For capacity reasons and for easier handling, the use of a multi-track wiper is recommended. For a comparative assessment it is not obligatory to use all types of soiling described in this method.

The test structure and the necessary equipment are specified in **Annex 2**.

4.2. Setting up the experiments

4.2.1 Pre-cleaning of the plates

The glass ceramic cooking fields are cleaned by intensive brushing with an undiluted alkali cleaner (ca. pH 10) and subsequently with an undiluted hand dishwashing liquid detergent. The plates are then left for 2 h in a hot cleaning solution at a temperature of 50-60 °C, consisting of a concentrated hand dishwashing liquid detergent (approx. 2%) and a descaler liquid (approx. 8%). Finally, using a chlorine-containing cleaner, two rinsing processes take place at 85 °C in a laboratory dishwasher operated with de-ionized water (overall time about 45 minutes per washing process).

4.2.2 Preparation and application of soiling, burn-in duration

Soiling must be always prepared freshly and applied to the tiles just after preparation.

The soiled surface on one test plate is 30 x 9 cm **(Sketch 1)**. The edges of the surface to be soiled are marked with a felt pen and then taped off with packing tape.

The corresponding quantity of soiling is applied and equally spread with a spiral wiper (for »tomato« soiling) or a film spreader (for the other soiling types), removing the superfluous soiling from the plate. The soiling dries overnight at room temperature before the packing tape is removed without any residues by simply pulling it off **(Fig. 1)**.

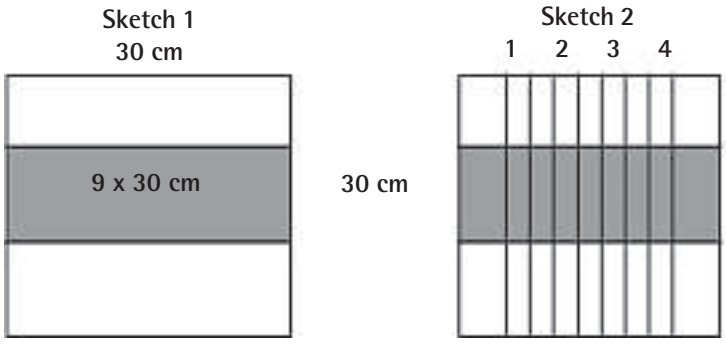
The soiling types are burnt in, using a preheated ambient-air ventilated warming cabinet at 200 °C and 240 °C for rice starch respectively; temperatures on the different grilles should not deviate from the standard temperature by more than 10 °C. The plates are placed individually next to each other on the grilles, with small marble blocks being placed underneath the plates. Before doing a comparative assessment, the effect of the position of plates during the burning-process in the warming cabinet or the position of the track on the plates needs to be evaluated **(Annex 3)**.

After cooling down to room temperature the plates can be stored upright in the laboratory for up to 10 days.

Soiling	Preparation	Burn-in temperature	Burn-in duration
Gravy	Knorr® Bratensauce aus der Tube (»gravy from the tube«) EAN 4038700101150) 33,3% suspension boiled in water Quantity applied per plate: 15 g Layer thickness(1): 200 µm	200 ± 10°C	15 min
Strained tomatoes	Strained tomatoes (7%) (Manufacturer Play, EAN 8002700472059) Quantity applied per plate: 15 ml Layer thickness(1): 200 µm	200 ± 10°C	13 min
Clotted cream/ Canned milk	Kleefeld®-Schmand (»clotted cream«) 24% fat, (EAN 4388440030044) Bärenmarke®, Die Ergiebige(2) (»canned milk«) 10% fat (EAN 400550081012) Quantity applied per plate: 15 g clotted cream/7.5 g canned milk Layer thickness(1): 25 µm	200 ± 10°C	15 min
Lime/starch	4% rice starch in salt water (20 +/- 4 °dH(3), e.g. tap water) see **Annex 1** Quantity applied per plate: 10 ml of Layer thickness(1): 200 µm	240 ± 10°C	30 min

(1) The quoted layer thickness merely describes the nominal layer thickness of the wiper and the film spreader respectively. The thickness of the applied film results from the nominal layer thickness and the thickness of the adhesive tape. The layer thickness of the applied soiling after drying was not determined.
(2) The sub-brand name »Die Ergiebige« means »high-yield«
(3) The abbreviation »dH« stands for water hardness in Germany (1 °dH = 10.00 mg/l CaO or 7.19 mg/l MgO)

Table 1 Soiling and burn-in conditions.



Sketch 1 and 2

Fig. 1 Applying a canned milk/clotted cream soiling.

4.3 Testing of cleaning performance

4.3.1 Initial work on test products
Check first whether or not the cleaners for glass ceramic cooking fields could be applied without residues using syringes, enabling dosing by measuring their volumes (chapter 4.3.3). If dosing by mass is necessary, determine the density of cleaners at room temperature (T = 21 +/- 1 °C) first. With this figure, the mass corresponding to a volume of 4 ml is calculated.

4.3.2 Preparing glass ceramic cooking plates
The glass ceramic cooking plates are placed in the wiping device; the soiled surface is in an angle of 90° to the wiping direction **(Sketch 2)**.

4.3.3 Applying the polyurethane sponges
The dry sponges are weighed on laboratory scales, and the weight is recorded. The sponges are placed in cold tape water and thus well-watered.
Immediately before the cleaning performance is determined, 4 ml each of cleaning product are drawn into 5 ml disposable syringes. Sponges are squeezed out by hand and subsequently placed in the multitrack wiper. Sponges should be moist before use but must definitely not drip. The water content of sponges in use should be 4-5 g.
The cleaners are evenly distributed on the upper side of the sponges by emptying the syringes. For cleaners that cannot be dosed with syringes, moist sponges are left on the laboratory scales. A mass of

glass ceramic cooking field cleaner corresponding to a volume of 4 ml is evenly applied to the upper side of a sponge with a spatula. The lower side of the sponge is then inserted in the multi-track wiper.

4.3.4 Cleaning testing
The bearing weight of the wiper is 400 g per sponge; using a Sheen four track wiper the bearing weight results from the mass of the intake of the sponge (300 g) and the use of a 100 g mass piece. The wiping speed is 37 wipes/min (back and forth counts as 1 wipe).
Cleaning lasts until approximately 75% of the soiling is removed on at least one track **(Fig. 2)**. The number of wiping processes needed to achieve this is recorded (back and forth counts as 1 wipe). The number of wiping processes should range between 20 and 40 wipes.
On completion of the wiping tests on a glass ceramic plate, the plate is rinsed with cold tap water and subsequently rinsed once more with de-ionized water to avoid lime spots. Plates dry standing upright at room temperature.
For each product sample, at least four tests per type of soiling are carried out on different plates and with different tracks.
Note: If a single track wiper is used, the product sample must be rinsed off carefully with cold tap water after the target number of wipes has been reached and before testing with the next sample can begin. Those parts of the plate that still have to be cleaned must under no circumstances come into contact with the water during this rinsing process.

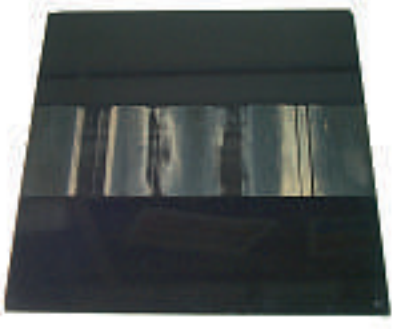


Fig. 2 Glass ceramic plate to assess the cleaning performance.

4.3.5 Assessment of the cleaning performance
Surfaces are inspected by at least three, or preferably five, experienced persons in an independent assessment without knowing which product sample has been used. As an alternative to visual assessment, a picture-analytical assessment is possible if the comparability of both forms of assessment has been proven in validation tests.
Measured against the benchmark of total cleaning, the cleaning performance is assessed, e.g. as follows:

0: No cleaning

50: Compared with total cleaning, only half of the surface is cleaned

100: Total cleaning (this outcome should be avoided, because total cleaning could have occurred before the end of all wiping cycles)

The gradation of the values should not be smaller than 5 percentage points.
One mean value per plate is determined for each product sample across all observers. The range in the assessments of one product sample per plate across all observers should not be wider than 20 percentage points. Mean values across all observers for one product sample in the comparison of the different plates should not diverge by more than 40 points.

4.4 Calculation of scores
A mean value across all observers and all plates is formed for each product sample, divided by 10 and rounded to whole numbers. Consequently the best possible score is »10« which stands for the perfect or near-perfect cleaning of the soiled surface. The lowest possible score is »0« which stands for a total or an almost total lack of cleaning performance.

4.5 Ranking and assessment for significant differences
The ranking of the visually determined cleaning effect and the assessment for significance in terms of ranking follows a recognized statistical method, such as the 3-factor variance analysis, taking into account the following factors: product sample, plate and position of the wiping track on the plate **(Annex 3)**.

4.6 Notes on evaluation of cleaning performance
The number of wiping processes should be between 20 and 40 wipes. The number of wipes required to clean increases with higher temperatures and also with longer burn-in durations. To keep within the stipulated number of wipes it is recommended, where necessary, to lengthen or shorten the burn-in duration respectively, whilst maintaining the same burn-in temperature.
In the comparative examination of more than four product samples it is obligatory to follow and to expertly evaluate a recognized statistical method, e.g. an incomplete balanced experimental design. The use of a reference product to validate results is recommended.

4.7 Cleaning performance: description of results
The outcome can only be described together with the relevant test conditions, as the achieved cleaning performance depends on the number of wiping processes. It is not permissible to calculate a mean value from results obtained with different soiling. Cross-comparisons of scores from various tests are not permitted either.

5. Exclusion criteria

Not only should cleaners for glass ceramic cooking fields thoroughly remove food soiling, they must meet some further requirements such as thorough removal of iridescent layers or material friendliness with the lowest possible mechanical and chemical attack to the glass surface. This IKW recommendation only describes tests that can be carried out with simple means. The manufacturers of glass ceramic cooking fields have other, in some cases more sophisticated test methods at their disposal, but these are not included in this recommendation for

assessing glass ceramic cook field cleaners.
The tests presented here as exclusion criteria should not be used to form a ranking in comparative product testing. However, if one of these tests is not passed, this indicates that a product sample cannot be recommended for the cleaning of a glass ceramic surface, because regular use of it could cause damage to the glass ceramic cooking field (scratches, rubbing off of decor, spots/films, etc).

5.1 Cleaning performance for iridescent layers

5.1.1 Test principle
This method simulates the repeated boiling over of water containing salt onto a heated surface and the formation of iridescent layers observed in this process. In such situations burn-in temperatures may exceed 500 °C.
The salt solution is evenly sprayed on a glass ceramic cooking field heated from below **(Annex 4).** The comparative assessment of the cleaning performance is made by rubbing off with a soft cloth onto which the test substance has been applied, determining the cleaning performance achieved after a given usage period by means of a comparison with a reference sample.

5.1.2 Preparation
Each undecorated glass ceramic plate can be used only once. The plates are rinsed thoroughly with cold tap water or a glass cleaner and subjected to a visual inspection.

5.1.3 Soiling the plates
The iridescent layers only form in the heated zone, with temperature gradients within the test segments to be taken into account. The plate is placed on an efficient laboratory cooker with a glass ceramic surface and preheated for 15 minutes at heating level 7(*). It is essential for a good temperature transfer to place the testing plate evenly on the heating plate.

(*) *The information on heating levels refers to the device described in Annex 3.*

0,5g of iodized table salt are dissolved in 250 ml of mineral water, Rhenser® brand **(Annex 5)**. The salt solution is completely and evenly sprayed on in 2 minute intervals (30 sec spraying/90 sec waiting time) while continuing to heat the plate. The plate is then left for 5 h on the laboratory cooker and heated in hourly intervals at heating level 7, i.e. it is alternately heated for 1 h at level 7 and left for 1 h on the laboratory cooker with the heating switched off.
After they have cooled down, the plates can be used or stored for a maximum of 10 days at room temperature in the laboratory.

5.1.4 Setting up the performance test
Prior to use, the plates are divided into 8 circular segments with narrow adhesive tape. First of all, the quality of the test specimen thus obtained must be examined: for this purpose, one circular segment of each of the test plates is cleaned with benchmark cleaning products A and B respectively **(Annex 6)**. The segment for cleaner A must be fully cleaned whilst easily noticeable residues must be left in the segment for cleaner B. Only plates that meet both these requirements can be used in the performance test.
For the test, 0.5 g of product sample per segment are applied and cleaned by a trained person with a soft cloth through intensive rubbing over 30 sec.
At least 2 tests per product sample are implemented on different plates and in different segments.

5.1.5 Assessment of the cleaning performance
Where possible, the cleaning performance is assessed by 3 experienced persons with no knowledge of the respective product sample in an independent evaluation against a reference sample **(**cleaner C, **Annex 6)**. A sufficient cleaning performance **(Table 2)** is only achieved if the test product is given either score 0 or score 1 and the iridescent layers are noticeably better removed than by the reference sample cleaner C.

5.2 Mechanical attack (hand test)

5.2.1 Test principle
This method simulates intensive rubbing in the removal of localized soilings. If unsuitable cleaners are used, this may cause stain-like and therefore particularly noticeable damage to glass ceramic plates.

5.2.2. Test implementation
The undecorated plates used in this test must be new; they must not have any visible damage or soiling on the surface. An area of approx. 5 x 5 cm is partitioned off for each test with adhesive tape; at least 2 tests should be carried out with each product sample. The product sample is applied in a sufficient quantity and intensively rubbed on for 60 sec with a soft paper tissue. If the test product is absorbed by the cloth during that time, more cleaning product must be applied.

Assessment	Cleaning effect
0	Cleaning of the surface after a single product application within the shortest period of time is very easily possible
1	Good cleaning, possibly after repeated product application, within 30 sec is easily possible
2	Medicore cleaning, also after repeated product application and with an increased expenditure of force
3	Iridescent layers cannot be removed
Passed	**Scores 0 or 1 for all tests**

Table 2 Assessment of the cleaning performance (iridescent layers).

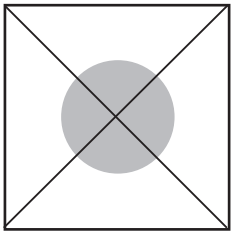
After one minute the treated surface is rinsed thoroughly with tap water or a glass cleaner. After drying it is assessed from different angles of incidence of light by at least one, but preferably several, experienced person(s) for mechanical damage **(Table 3)**.

5.2.3. Décor care
Another important aspect with decorated glass ceramic surfaces is the rubbing off of décor. For this test, no simple hand method has been agreed upon as yet. Consequently, for the time being this IKW recommendation can only point to experiences gained by manufacturers of glass ceramic cooking fields.

5.3 Chemical attack

5.3.1 Test principle
This test simulates the heating up of glass ceramic cooking fields with cleaners left on the cooking fields unintentionally or intentionally (as a protection against re-soiling or damage by caramelizing sugar).

5.3.2. Test implementation
Each glass ceramic plate can be used only once.
The plates are rinsed thoroughly with water or a glass cleaner and undergo a visual inspection.
The soiled surface corresponds to the heated zone; inevitable temperature gradients are to be taken into account. 2 plates are diagonally divided into 4 segments with adhesive tape **(Sketch 3)**. 0.5 g of product sample are applied per segment and distributed on the first plate by an experienced person to form a thick, clearly visible layer. On the second plate, the product samples are rubbed by an experienced person into a thin layer but not fully polished out.



Sketch 3

Assessment	Mechanical damage
0	no visible mechanical damage
1	Slight mechanical damage (polishing effect, delustering)
2	Isolated scratches (macroscopically visible)/ considerable delustering of the surface
3	Major mechanical damage (scratches and/or delustering)
Passed	**Scores 0 or 1 for all tests**

Table 3 Assessment of mechanical damage.

After removal of the adhesive tapes the plates are placed on a laboratory cooker with a glass ceramic surface and, under a vent, slowly heated up from level 2 to level 9 (approx. 5 min/level). When level 9 is reached, the plate is heated at this temperature for 2 hours. After the plates have cooled down, the residues of the product sample are removed with the same cleaner. If necessary, a special cleaner **(Annex 7)** is used.
The treated surface is rinsed thoroughly with tap water or a glass cleaner. After drying it is assessed by at least one, but preferably several experienced person(s) for damage **(Table 4)**.

Annexes

Annex 1:
Cleaning performance: preparation of a rice starch suspension

Annex 2:
Cleaning performance: test design, equipment and suppliers

Annex 3:
Assessment example

Annex 4:
Equipment and suppliers

Annex 5:
Composition of Rhenser® mineral water

Annex 6:
Removal of iridescent layers

Annex 7:
Recommended marketed cleaners to remove product residues

Pictures:
Anne Wolf and *Alexandra Hary*, Reckitt Benckiser

Literature

(1) IKW-Empfehlung zur Qualitätsbewertung der Reinigungsleistung von Glaskeramik-Kochfeldreinigern«, SÖFW Journal 130, ?-2004, p??-??

Assessment	Chemical attack
0	No visible changes to the surface, product residues were fully removed using the same cleaner
1	No visible changes to the surface, product residues were fully removed using a special cleaner
2	Visible spots or coatings, possibly shades, impossible to remove even when using a special cleaner
3	Major lasting changes to the surface
Passed	**Scores 0 or 1 (thin layer)** **Scores 0, 1 or 2 (thick layer)**

Table 4 Assessment of chemical attack.

Annex 1: Cleaning performance: preparation of a rice starch suspention.

100.0 g rice starch suspension (4 %) contains:
95.6 g tap water (20 +/- 4° dH)
4.0 g rice starch, highest purity
0.4 g sodium chloride (for analysis)

Preparation:
The mass of a 250 ml beaker is determined and recorded. 95.6 g of tap water are poured into this beaker; 4 g of rice starch and 0.4 g of sodium chloride are then added by stirring them in with a magnetic heat stirrer.

The suspension is heated until it is boiling rapidly. Caution: the suspension can easily overflow from the beaker.

The suspension is then left to cool down to room temperature, and must be stirred during that time. The mass loss is determined by weighing the filled beaker and compensated for by adding tap water.

Prior to use, the suspension is homogenized on the magnetic heat stirrer. The suspension must be freshly prepared daily.

Supplier:

Carl Roth GmbH & Co
Schoemperlenstraße 1-5
76185 Karlsruhe
Germany
Tel.: +49 721 56 06-0
Fax: +49 721 56 06-149
Email: info@carlroth.de

Starch from rice (CAS 9005-25-8), depur, order no. (1 kg): 9368.1
Sodium chloride p.a. (CAS 7647-14-5), order (1 kg): 3957.1

Please check product designations with manufacturers where necessary.

CLEANERS FOR GLASS CERAMIC COOKING FIELDS

Annex 2: Cleaning performance: test design, equipment and suppliers.

Undecorated glass ceramic cooking fields, brand CERAN®, 30 x 30 cm
Company: Schott Glas
Hattenbergstrasse 10
55122 Mainz, Germany
Email: Frank.Milius@schott.com
Tel. +49 6131 66-2293, Fax: +49 6131 66-2045

Spiral wiper model 358/150 for layer thicknesses 50 and 200 µm
Film drawing frame for layer thicknesses 25, 50, 100 and 200 µm
Company: Erichsen GmbH+Co KG,
Am Iserbach 14
58675 Hemer-Sundwig, Germany
Tel. +49 2372 6431, Fax +49 2372 6430

Fig. 3 Equipment to perform the cleaning performance test.

Four track wiper
Company: Sheen Instruments LTD.
Unit 4, St. Georges Ind. Est. Richmond Road
Kingston upon Thames
Surrey, England, KT2 5BO
Tel. +44 181 5414333, Fax +44 181 549 3374

Without burden, a sponge fixture of this device weighs 300 g, i.e. the total weight with a 100 g burden is 400 g. The total weight of fixtures and burdens must be identical for all four tracks.

Magnetic stirrer with heat
e.g. IKAMAG® RET basic C with magnetic mixing rods PTFE coated
Speed range: 0-1500 1/min, heater power: 600 W
Company: IKA Werke GmbH & Co. KG
Janke & Kunkel-Str. 10
79219 Staufen, Germany
Tel.: +49 7633 831-0, Fax: +49 7633 831-98
Email: sales@ika.de

Polyurethane sponges PU foam T 4055, white (order no. 230006395),
size 87,5 x 40 x 37,5 mm (cut to fit in the wiper)
Company ISL Schaumstoff-Technik GmbH
Industriestrasse 17
68519 Viernheim, Germany
Tel. +49 6204 706-0, Fax: +49 6204 706-170

Adhesive tape tesapack®, brown, PVC, strong adhesive power (5 cm wide) with dispenser

Felt pen, eg. Edding 3000®

Alkali cleaner (pH 10), e.g. Cava Seul Dampkap Cleaner®

Concentrated hand dishwashing liquid detergent, e.g. Tempo ultra®

Descaler, e.g. Cillit Kalk- und Rostreiniger®

Ventilated warming cabinet (240 °C), e.g. Memmert® ULE 800 or WTB Binder® FD 240

Laboratory dishwasher, e.g. Miele Electronic® G7747

Liquid Automatic Dishwashing Detergent (chlorine-based), e.g. Calgonit Classic liquid®

Top scale balance, required reading accuracy 0.1 g, e.g. Sartorius® LC62005

Immersion body for density measuring or another method to measure density

Small marble blocks
e.g. 30 x 30 x 20 mm of »Bianco Carrara«
Company: Naturstein Hubert Kohlenberg
Oberer Hang 3,
40699 Erkrath, Germany
Tel.: +49 2104 93 21-52, Fax: +49 2104 93 21-51
Email: Kohlenberg@t-online.de

Disposable syringes 5 ml
e.g. B/Braun Omnifix, latex-free, type Luer
Company: VWR International GmbH
Hilpertstr. 20A, 64295 Darmstadt, Germany
Postfach 20 02 42, 64301 Darmstadt, Germany
Tel.: +49 6151 39 72-0, Fax: +49 6151 39 72-450
Email: darmstadt@de.vwr.com

Annex 3: Assessment example.

Evaluations by observers

	Plate 1				Plate 2			
Observer	I	II	III	IV	IV	I	II	III
A	95	80	30	90	70	75	85	10
B	90	80	20	90	75	80	95	10
C	95	70	25	85	70	90	95	10
D	95	90	35	85	70	75	90	20
E	95	80	15	90	60	95	95	5

	Plate 3				Plate 4			
Observer	III	IV	I	II	II	III	IV	I
A	0	85	80	70	70	25	80	70
B	0	90	90	60	75	10	85	70
C	0	90	85	80	70	30	85	75
D	5	85	85	80	70	20	80	70
E	0	95	95	80	90	15	85	80

Mean value of observations

	I	II	III	IV
Plate 1	94	80	25	88
Plate 2	83	92	11	69
Plate 3	87	74	1	89
Plate 4	73	75	20	83
Mean value	**84**	**80**	**14**	**82**
Score	**8**	**8**	**1**	**8**

3 factor variance analysis: results dependent on plate, track and test product

Variable	Type	Level	Values
Plate	defined	4	Plate 1, Plate 2, Plate 3, Plate 4
Track	defined	4	Track 1, Track 2, Track 3, Track 4
Test Product	defined	4	Cleaner: I, II, III, IV

Results dependent on variables:

Variable	Degrees of freedom	F-value	P-value	Evaluation
Plate	3	1,08	0.424	not significant
Track	3	1,79	0.249	not significant
Test product	3	66,13	0.000	significant
Test error	6			
Total	15			

Result:

Test Product	**I**	**IV**	**II**	**III**
Mean value	**84**	**82**	**80**	**14**
Score	**8**	**8**	**8**	**1**

The test products linked with a line are not significantly different
(selected significance level: 95%)

Assessment in a 3-factor variance analysis with MINITAB® Statistical Software, release 13.20

Minitab Ltd.
Unit E1 Brandon Court, Progress way
Coventry CV3 2TE
United Kingdom
Tel. +44 (0) 24 7665 2777
Fax +44 (0) 24 7665 2888
http://www.minitab.com

Distribution in Germany:
ADDITIVE GmbH
Rohrwiesenstrasse 2
61381 Friedrichsdorf/Ts, Germany
Tel: +49 (0) 6172.5905.30
Fax: +49 (0) 6172.77613
http://additive-net.de
Email: info@additive-net.de

CLEANERS FOR GLASS CERAMIC COOKING FIELDS

Annex 4: Exclusion criteria: equipment and suppliers.

Laboratory cooker SLK 2 with infrared radiation heater, 1.8 kW
Company: Schott Geräte GmbH
Hattenbergstr. 10
55122 Mainz, Germany
Tel.: +49 6131 66-5111, Fax: +49 6131 66-5001
Email: schott.geraete@schott.com

Spray gun BUDGER® Airbrush Modell 150
Head type L
largest nozzle diameter 0.77 mm
Supplier: Maschinenbau ARNHOLD
Linderhauserstraße 34-38
42279 Wuppertal, Germany
Tel.: +49 202 504061, Fax: +49 202 508816

or

Krautzberger spray gun
Perfekt 4 model
0.5 mm material, round nozzle
Stockbornstraße 13
65333 Eltville am Rhein, Germany
Hotline +49 6123 698-222

Fig. 4 Equipment to perform the performance in removal of iridescent layers.

Paper towels WYPALL® classic wipes
(75 OST=RO white 7452) article no. 5010179003
Supplier: Harry Wegner
Hammerbrookstraße 47
20097 Hamburg, Germany
Tel.: +49 40 237007-0, Fax: +49 040 234206

Reference products cleaners A, B, C (see **Annex 5**)

Annex 5: Composition of Rhenser® mineral water.

Manufacturer: Rhenser Mineralbrunnen, 56321 Rhens, Germany

Contents	[mg/l]
Sodium	64.5
Potassium	3.8
Magnesium	20.7
Calcium	109.0
Fluoride	0.35
Chloride	73.8
Sulfate	73.0
Hydrogen carbonate	379.0

Annex 7: Recommended marketed cleaners to remove product residues.

Recommended marketed cleaners to remove product residues in the testing for chemical attack (chapter 5.3), status July 2004.

Sidol für Ceran & Edelstahl®
(Manufacturer: Henkel KGaA)

CERA Clen®
(Manufacturer: Reckitt Benckiser AG)

Glaskeramik-Reiniger®
(Manufacturer: Brauns-Heitmann GmbH)

Annex 6: Removal of iridescent layers (chapter 5.1).

Reference cleaner: (% information »as obtained«):

	A	B	C
Secondary alkane sulfonate (Hostapur® SAS 60, Clariant)	5.80 %	5.80 %	5.80 %
Xanthan derivative (Kelzan S®. Kelco)	0.70 %	0.70 %	0.70 %
Fatty alcohol polyglycol ether (Genapol® UD 30. Clariant)	2.90 %	2.90 %	2.90 %
Aluminium oxide (Martipol® 202. Martinswerk. Bergheim)	7.20 %	7.20 %	7.20 %
Propylene glycol. technical	2.90 %	2.90 %	2.90 %
Isothiazolinone derivatives (Mergal® K 9 N. Troy)	0.09 %	0.09 %	0.09 %
Tap water. demineralized	79.41 %	80.41 %	80.11%
Citric acid (per analysis)	1.0 %	0.0 %	0.3 %
pH value	2.5 - 2.7	8.3 - 8.5	3.4-3.7
Density [g/ml]	1.03-1.09		
Viscosity (flow cup) [s]	ca. 6.25		

Defoamer can be added as necessary.

Irritant

R phrase R36 Irritating to eyes.
S phrase S2 Keep out of reach of children.
S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S46 If swallowed, seek medical advice immediately and show this container or label.