



3M™ Easy Clean Coatings

For Non Porous Surface Protection

Advanced Materials Division

January 2018



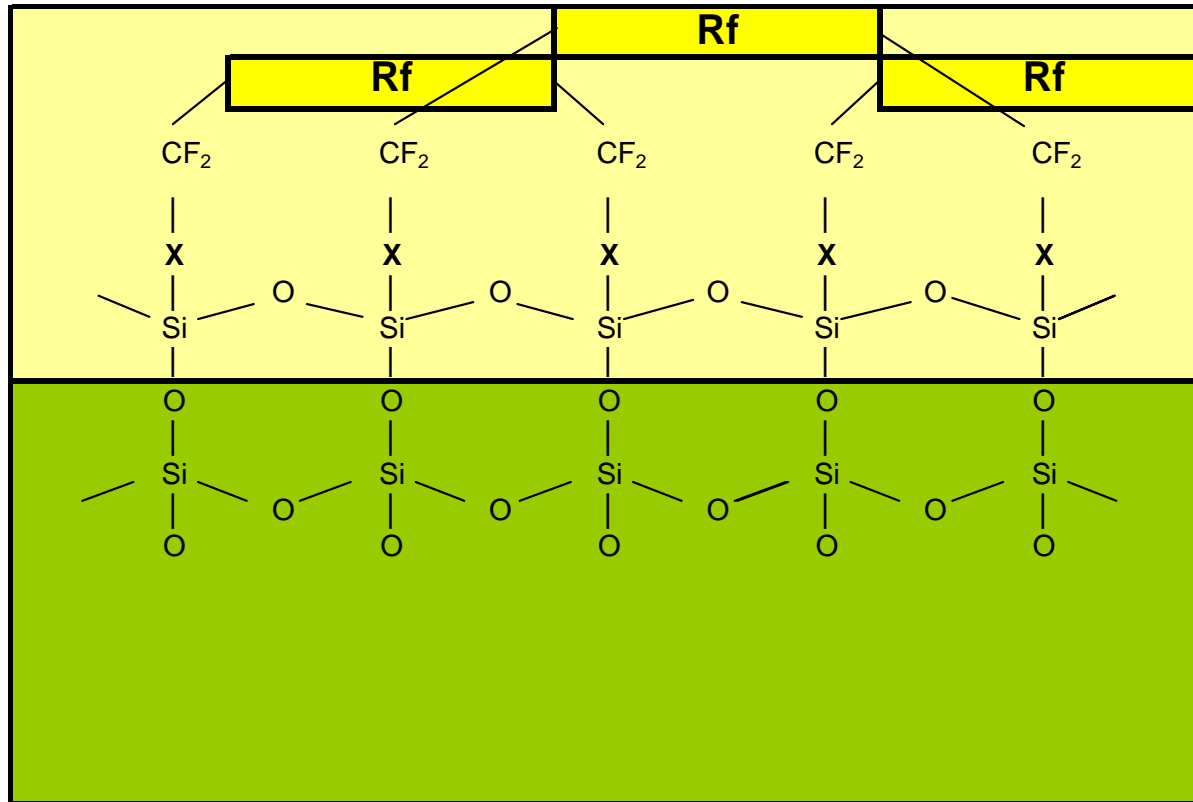
3M™ Easy Clean Coatings (ECC) Product Portfolio

Fluorosilanes

ECC-1000	100% fluorosilane	Ceramic/Glass
ECC-3000	10% fluorosilane	Glass
ECC-4000	10% fluorosilane	Ceramic/Glass
ECC-6000	0.1% fluorosilane	Glass/PC
ECC-7000	10% fluorosilane	Glass/Ceramic
ECC-7500	10% fluorosilane	Glass/Ceramic

The ECCs are based on perfluoro polyether silane chemistry.

3M™ Easy Clean Coatings on Siliceous Substrates



Bonded fluoropolymer layer

Siliceous substrate

(glass, ceramic or enamel)

Benefits and Features of 3M™ Easy Clean Coatings Treatment

- Stains do not spread and easy to remove
- Hard water deposits easy to remove
- Less time and effort needed to clean
- Potential for reduced cleaning frequency
- No aggressive cleaners needed
- Lower need for water and detergents
- Improved hygiene (less residues)

3M™ Easy Clean Coatings

- Chemical reaction of silane to silicate surface (glass, ceramic)
- Catalysts for cure: water, acid, heat
- Chemical bond very resistant and durable (except high pH and UV)
- Very low surface tension of fluorosilane (17-18 mN/m)
- Nanocoating: typical thickness 5-20 nm (determined by application)

3M™ Easy Clean Coatings - Application Examples

- Fluorochemical silanes – chemically react with siliceous surfaces
- To treat non-porous substrates – glass, ceramics
- Applied by spraying, wiping, dipping and vapor process
- Thermal or acid cure
- Resulting in a durable water, oil and stain repellent coating
- No aggressive cleaner needed, keep things looking good longer

High level Application Examples:

- Ceramic sanitary ware treatment
- Bath room shower glass treatment
- Ophthalmic lens oil repellent coating by CVD
- Electronic display coatings

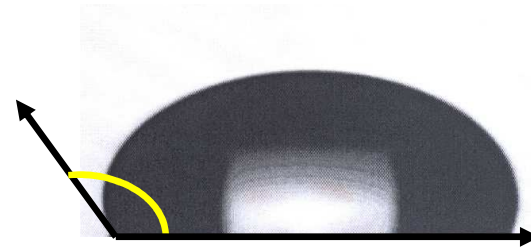


Quality Check on Invisible 3M™ Easy Clean Coatings → contact angle measurement

- A measure for the substrate's surface energy (performance)
- Enables to check the coatings integrity/homogeneity



Untreated ceramic tile
Contact angle: **38°**



Ceramic tile treated with ECC-4000
Contact angle: **110°**

Due to the fluoropolymer coating, the surface obtains a low surface energy, repelling the droplet and causing a drastic increase in contact angle.

Typical Performance Data Example

3M™ Easy Clean Coating ECC-4000

On Ceramic Surface	ECC-4000 Treatment
Initial contact angles (water / hexadecane)	90°–110°/60°–65°
Contact angles after abrasion 50,000 cycles with WC-EEND™ Cleaner 40 Cycles with Cif™ Cleaner	80°–95°/45°–50° 70°–80°/40°–45°
Contact angles after exposure to 18% HCl at 20°C for 24 hours	90°–95°/50°–55°
On Glass Surface	ECC-4000 Treatment
Initial contact angles (water / hexadecane)	100°–120°/60°–70°
Tilt angles (water)	15°–20°
Contact angle (water) 2000 cycles with brush/water 4000 cycles with brush/water	100°–110°/50°–60° 90°–100°/50°–60°
Contact angles after exposure to 18% HCl at 20°C for 24 hours	90°–100°/50°–60°

3M™ Easy Clean Coatings Application

Formulation Recommendations – Glass and Ceramic

0.1% ECC-1000
8% Acetic acid
2% Demineralized water
Rest Ethanol

1% ECC-3000 / ECC-4000
glass: 0.1 % Hydrochloric acid (37%)
ceramics: 1.0 % Hydrochloric acid (37%)
Rest Ethanol

1% ECC-7000/ ECC-7500
glass: 0.2 % Hydrochloric acid (18%)
ceramics: 1.0% Hydrochloric acid (18%)
Rest Ethanol

Application conditions

spray at 3.5 – 4.5 bar
approx 35-50 g/m²
air drying

Substrate and the Coating Solution Preparations

Substrate Preparation

- Before treatment, the part should be cleaned (using aqueous detergents, acetone or ethanol) in order to remove dust and other contamination. This cleaning step is not necessary for freshly prepared parts.
- The temperature of the substrate should preferably be 15–30°C (60– 85°F).

Coating Solution Preparation (example of 3M™ Easy Clean Coating ECC 4000/3000)

- 980 g ethanol (less than 0.1% water; can be denaturated with alcohols, ethers and ketones)
- Add 10 g of ECC 4000, mix well
- Add 10 g of 37% HCl (12N) by weight
- Mix well to obtain a slightly hazy solution

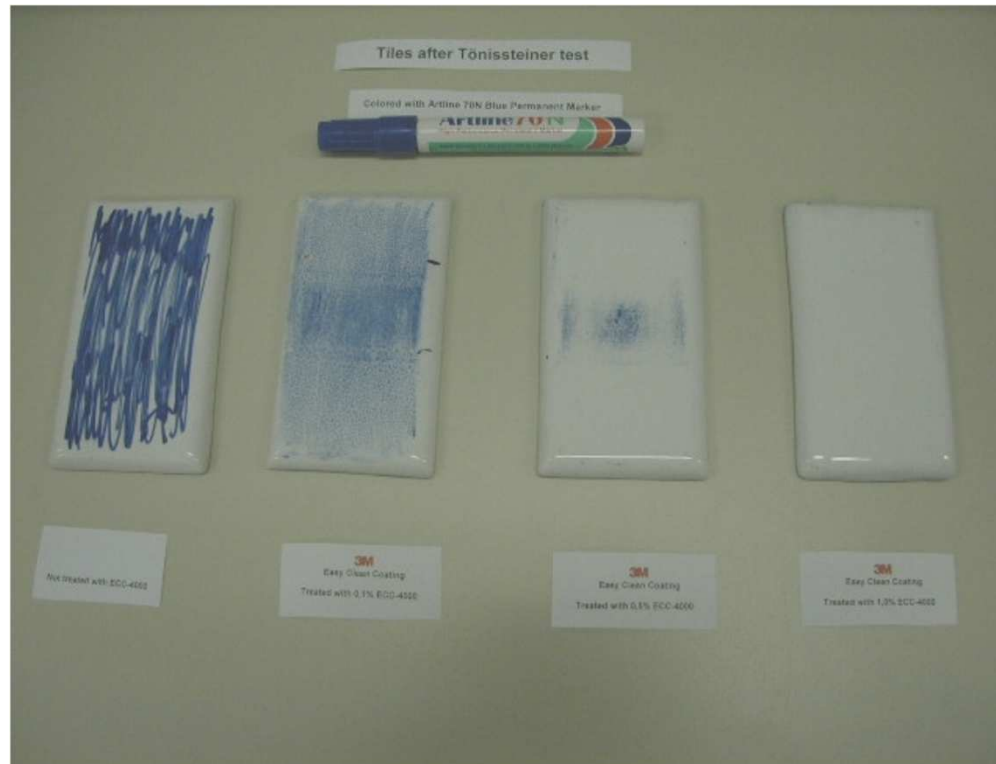
3M™ Easy Clean Coatings Application

Application

- Spray the part uniformly with an air atomized micro droplet spray of the prepared solution at a pressure of about 2 bar (29 psi).
Distance from spray pistol to substrate is approximately 10–20 cm (4–8 in.).
- The consumption of solution should be approximately 30–40 g/m² (0.1–0.13 oz/ft²) for machine application and about 40–60 g/m² (0.13–0.2 oz/ft²) for manual application.
- Dry at room temperature for 10–30 minutes before handling or packaging.
- Check the aesthetics of the treated part. If excess coating is present, wipe it off with ethanol after about 10–30 minutes.
- Although good performance is usually achieved after a few minutes, it may take up to 48 hours before final performance is achieved.

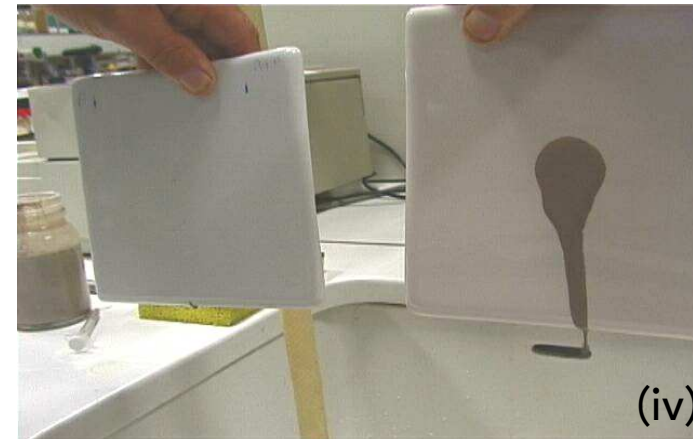
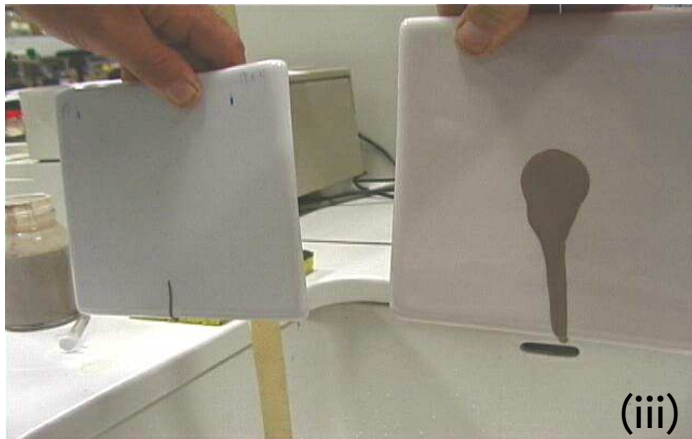
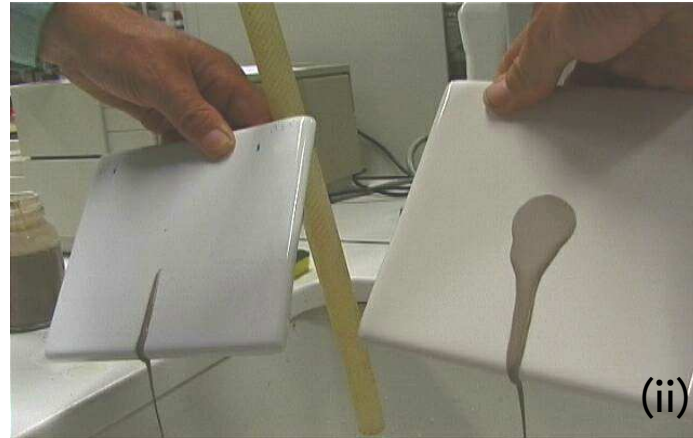
3M™ Easy Clean Coatings Application of Different Dilutions (at 60 g/m²)

Ceramic Tiles
treated with different ECC-4000 dilutions
after hard water baking, permanent marker coloring and soft paper towel wiping



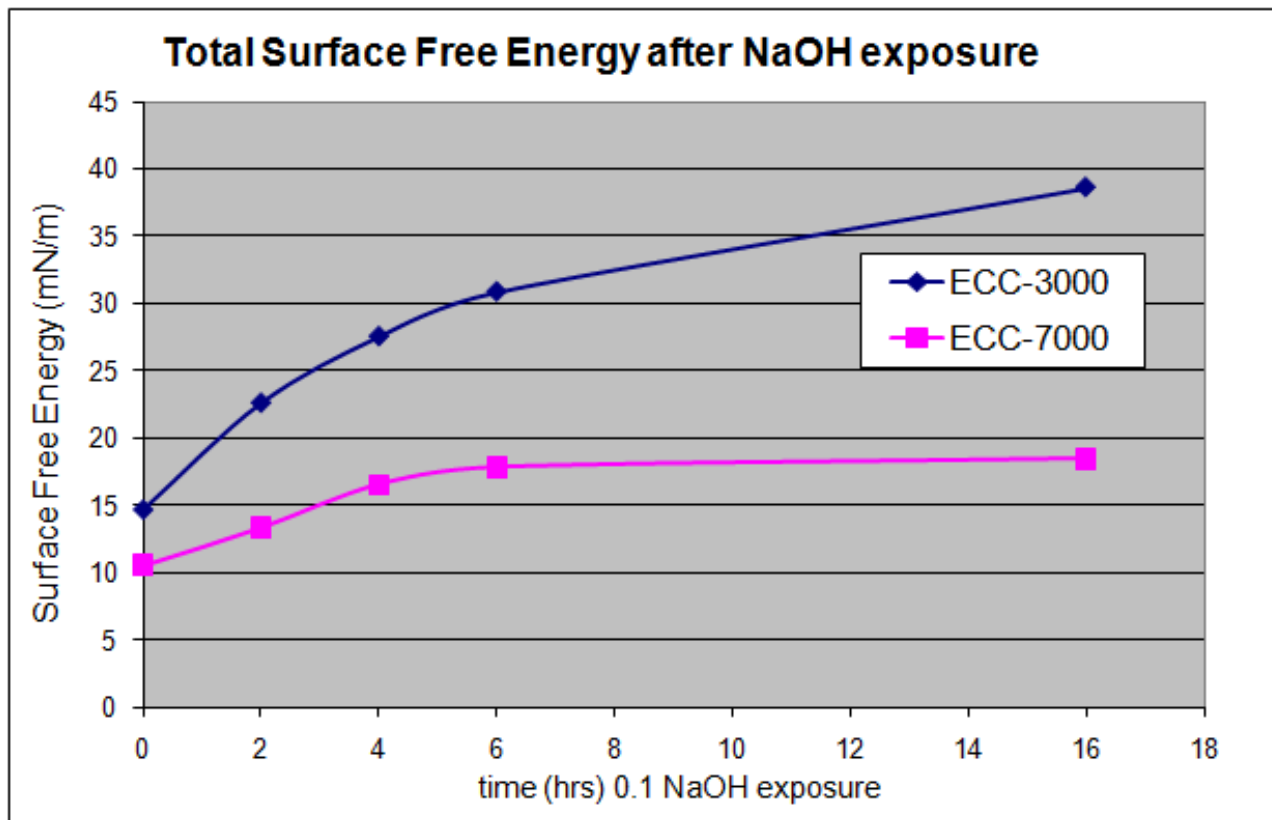
3M™ Easy Clean Coatings Performance Demonstration

Mud Tilt Angle



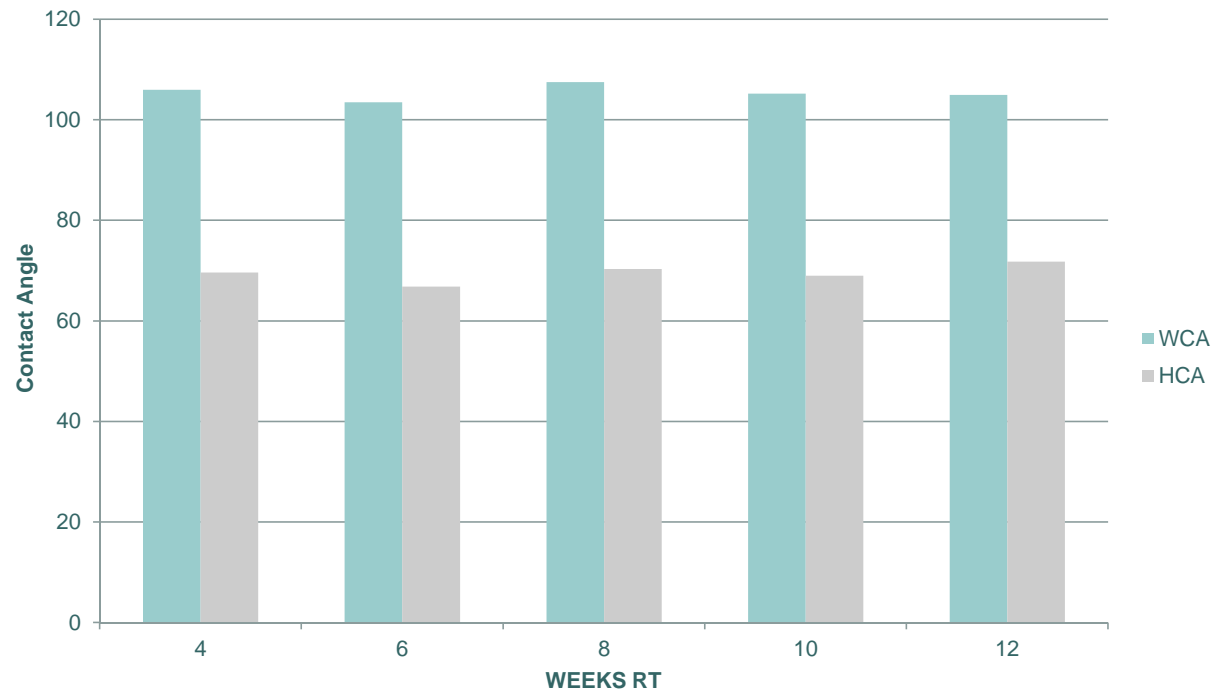
Improved Base (pH > 9) Resistance of 3M™ Easy Clean Coating ECC-7000

ECC-3000/4000 vs. ECC-7000



Demonstrating Improved Bath Life of 3M™ Easy Clean Coating ECC-7000

Contact Angles on coatings
with aged ECC-7000 baths



⇔ ECC-3000/4000 bath life: < 24 hrs



Thank you

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