



## Levasil Colloidal Silica a key ingredient in ceramic coatings

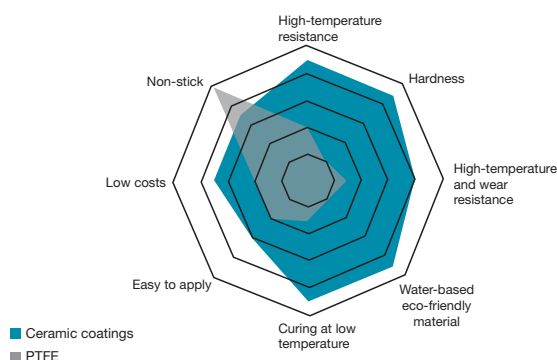
**Non-stick coatings have made cooking and household cleanup easier than ever before. Unfortunately, some non-stick coatings have poor scratch resistance and tend to chip off.**

Most non-stick coatings used for cookware are produced from organic (PTFE-based) or inorganic (ceramic-based) materials. While PTFE-based coatings have excellent non-stick properties and good corrosion resistance, they have poor wear resistance at high temperatures and can only be safely used below 260°C. Above this temperature, these coatings will release toxic compounds.

More and more cookware are being developed using ceramic coatings. By adding colloidal silica to these coating compositions, the mechanical properties and the temperature stability are improved. The resulting surfaces are more durable and do not scratch as easily from use.

Moreover, ceramic coatings are considered better for the environment than PTFE-based coatings. Ceramic coatings do not release toxic compounds at high temperatures and VOC emission is lower when the coatings are being applied to a surface. Likewise, colloidal silica dispersions are considered safe for both humans and the environment.

### Non-stick coating material properties comparison diagram



### How it works

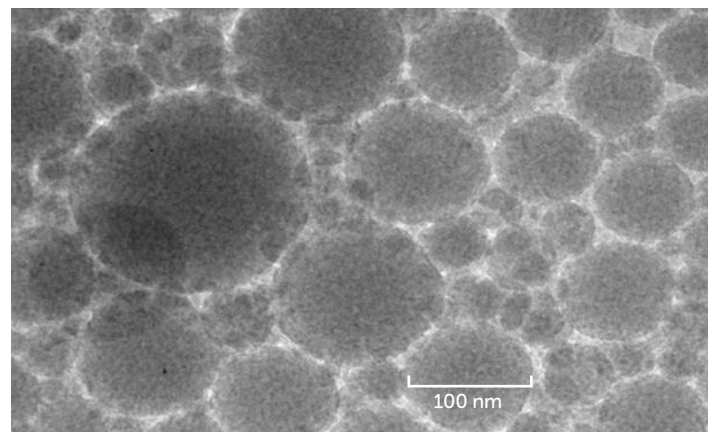
Colloidal silica dispersions consist of very small particles of amorphous silicon dioxide ( $\text{SiO}_2$ ), dispersed in water. Non-stick ceramic coating composition consists of pigments and fillers, dispersant, wetting agent, silane, silicone oil and colloidal silica. Colloidal silica acts as a binder and reacts with the silane to form a composite structure.

Coatings may consist of different layers with an optimized composition at each layer. In ceramic non-stick coatings, our Levasil products:

- Contribute to a strong and dense layer
- Minimize layer porosity
- Improve abrasion, scratch and corrosion resistance

Coating formulations made with colloidal silica help resist surface abrasions and scratches in two principal ways:

- Colloidal silica increases the cross-linking density of reactive groups in organic resins thanks to its high number of hydroxyl surface groups.
- Colloidal silica particles are very hard (5.5 on the Mohs scale of mineral hardness) and significantly improve coating hardness.



Scanning electron microscopy (SEM) image of colloidal silica, showing the high packing density formed from large and small particles.

## Product recommendations

The amount of the selected Levasil product must be optimized for each unique coating composition. We offer a number of products of varying particle size and size distribution for pigments and fillers. In the list below you find the products most commonly used in ceramic coatings.

Product	SiO <sub>2</sub> (%)	pH (m <sup>2</sup> /g)	Surface area (nm)	Particle size
Levasil CT16 APL	30	10.0	160	17
Levasil CT20 DH	34	2.8	200	14
Levasil CT24 PL	30	10.0	250	11
Levasil CT8 PL	45	10.2	85	32

## Ceramic coatings for other applications

The most well-known use for ceramic coatings is cookware but there are many other applications such as bakeware, hair straighteners and clothes iron surfaces.

A great potential for ceramic coatings is in metro systems and railway vehicles since they reduce fire hazards as they are noncombustible and smokeless.

## Safety and Handling

Colloidal silica products are aqueous dispersions of amorphous silica. Colloidal silica is not classified as harmful, but as mildly irritating. Before using these products, refer to the corresponding Safety Data Sheet for health, safety and environmental information.

### What is colloidal silica?

- Very small particles of amorphous silica (SiO<sub>2</sub>), dispersed in water
- Safe for both humans and the environment
- Large surface area, due to the numerous small particles
- The particles are usually electrically charged, why they can easily bind to one another or to other substances

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