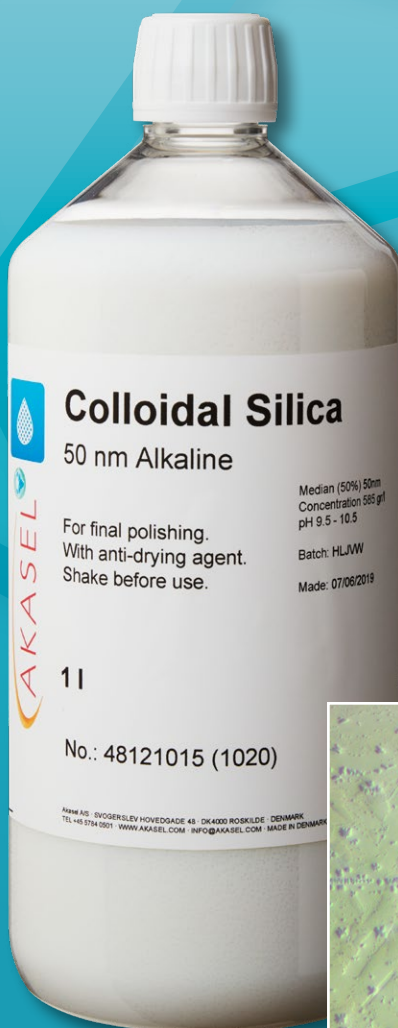




Oxide Polishing

– THE SMARTER ALTERNATIVE
FOR A PERFECT SURFACE FINISH

- Sub-micron, deformation-free polishing
- Very fast polishing results
- With anti-drying agent

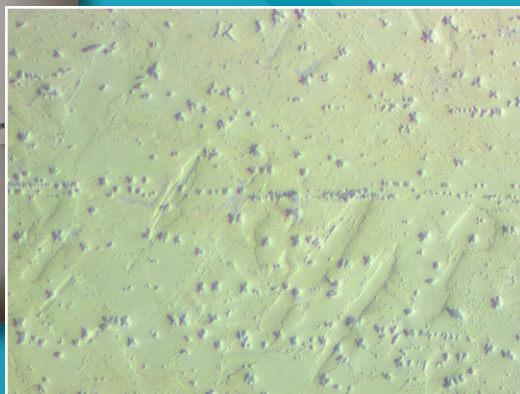


SUB-MICRON, DEFORMATION-FREE POLISHING

Nano-sized particles remove the last deformation after diamond polishing

VERY FAST POLISHING RESULTS

Chemical-mechanical polishing removes material very fast in a combined action



WITH ANTI-DRYING AGENT

Restricts suspension from drying on the polishing cloth and in the dosing tubes



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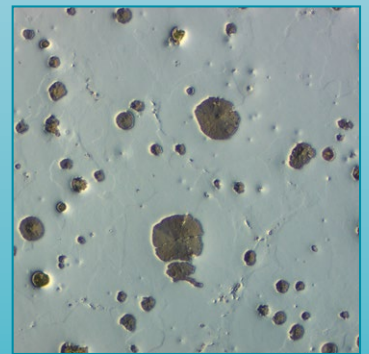
Our oxide polishing suspensions provide you with the best possible polishing results for all materials.

SiO₂ Based Oxide Polishing Suspensions

Colloidal Silica, Alkaline, 50 nm

The most universal of our oxide polishing suspensions, Colloidal Silica, can be used for numerous materials and is especially suited for heterogeneous materials. Colloidal Silica removes material, also from different phases, evenly and produces a scratch-free surface with very limited relief between phases.

For specific applications, it is necessary to add chemical reagents to Colloidal Silica to remove material faster and to obtain a scratch-free result.



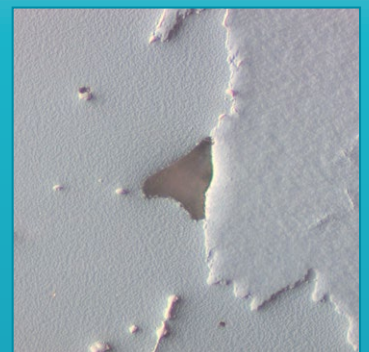
Nodular Cast Iron, DIC, 200x after polishing with Colloidal Silica, Alkaline.

Fumed Silica, Alkaline, 0.2 µm

Fumed Silica is more aggressive than Colloidal Silica. It is therefore often used for rather ductile materials, where more material has to be removed in order to get past the deformed layer after diamond polishing.

Fumed Silica has a more powerful chemical action and can therefore produce stronger relief between phases. For certain examinations this is an advantage as etching can be avoided. Fumed Silica can also be mixed with etchants to further increase the chemical activity, to speed up material removal and to obtain a scratch-free result for specific applications.

Fumed Silica is also available in a water-free (WF) version for water sensitive materials.



Porosity in Superalloy, DIC, 500x after polishing with Fumed Silica, Alkaline.



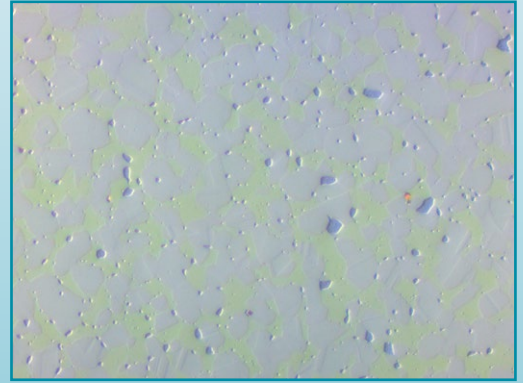
Zinc coating on steel, BF, 500x after polishing with Fumed Silica, WF.

Chemical-mechanical Polishing

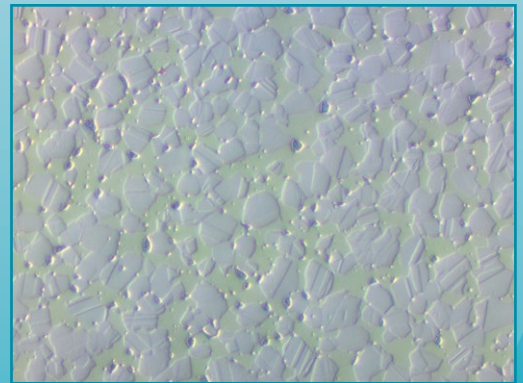
Both our silica suspensions are slightly alkaline for the best polishing result. The combination of chemical activity and careful abrasion of the sub-micron sized particles provides a powerful yet gentle abrasion. Additionally, material specific chemicals or etchants can be added to further speed up the final preparation step. For some specific applications they must be added to obtain a scratch-free result. Very short polishing times of 1 - 2 minutes are often sufficient for a deformation-free finish suited for optical microscopy. For completely deformation-free results, e.g for EBSD or colour etching, polishing times may need to be extended.

The micrographs on the right show brass after the preparation with either Colloidal Silica or Fumed Silica with additives in the following composition: 96 ml Silica, 2 ml H₂O₂ (30%), 2 ml NH₄OH (25%).

Both results are absolutely scratch-free. The finish after polishing with Colloidal Silica shows a minimum of relief whereas Fumed Silica produces a much stronger relief. Depending on the requirements either one can be used.



Brass, DIC, 500x after polishing with Colloidal Silica, Alkaline, with additives.



Brass, DIC, 500x after polishing with Fumed Silica, Alkaline, with additives.

Recommended additives to Colloidal and Fumed Silica for various materials

Copper, Brass and Bronze	96 ml Colloidal or Fumed Silica Suspension, 2 ml H ₂ O ₂ (30% Hydrogen peroxide), 2 ml NH ₄ OH (25% Ammonium hydroxide)
Copper	90 ml Fumed Silica Suspension, 10 ml of: 50 ml H ₂ O + 50 ml C ₂ H ₅ OH (Ethanol), 1 g Fe (NO ₃) ₃ × 9 H ₂ O (Iron(III) nitrate nonahydrate)
Pure Lead	90 ml Fumed Silica Suspension, 10 ml of: 84 ml C ₃ H ₈ O ₃ (Glycerol) + 8 ml CH ₃ COOH (Acetic acid) + 8 ml HNO ₃ (65 % Nitric acid)
Pure Silicon	Pure Silica Suspension or 90 ml Silica Suspension, 10 ml H ₂ O ₂ (30% Hydrogen peroxide)
Tantalum	90 ml Colloidal or Fumed Silica Suspension, 10 ml H ₂ O ₂ (30% Hydrogen peroxide)
Titanium and Titanium alloys	96 ml Fumed Silica Suspension, 2 ml H ₂ O ₂ (30% Hydrogen peroxide), 2 ml NaOH (10% Sodium hydroxide)
Titanium alloys	90 ml Colloidal or Fumed Silica Suspension, 10 ml H ₂ O ₂ (30% Hydrogen peroxide)
Pure Titanium	90 - 70 ml Colloidal or Fumed Silica Suspension, 10 - 30 ml H ₂ O ₂ (30% Hydrogen peroxide)
Zinc and Zinc alloys	96 ml Colloidal or Fumed Silica Suspension, 2 ml H ₂ O ₂ (30% Hydrogen peroxide), 2 ml NH ₄ OH (25% Ammonium hydroxide)

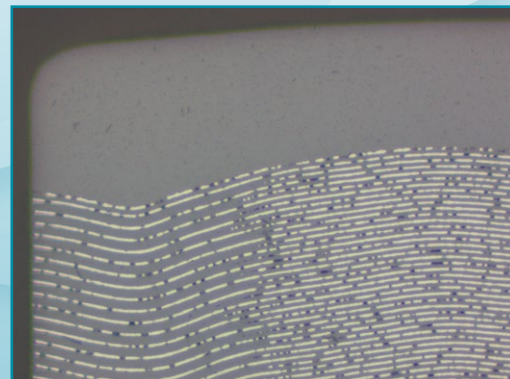
Al₂O₃ based Oxide Polishing Suspension

Alumina, Neutral, 50 nm

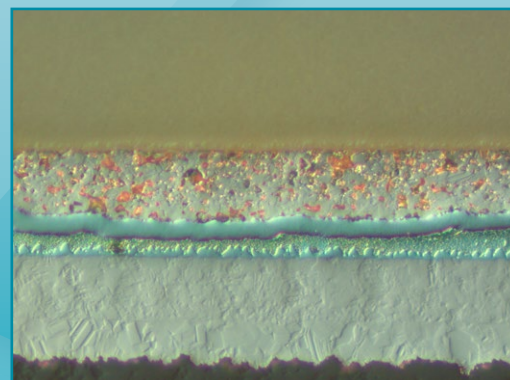
Our Alumina suspension is pH neutral and therefore does not attack different phases differently. This makes it well suited for general applications. Our Alumina suspension has a quite high viscosity that makes it stay on the polishing cloth, allowing for low dosing levels and consumption.

Anti-drying Agent

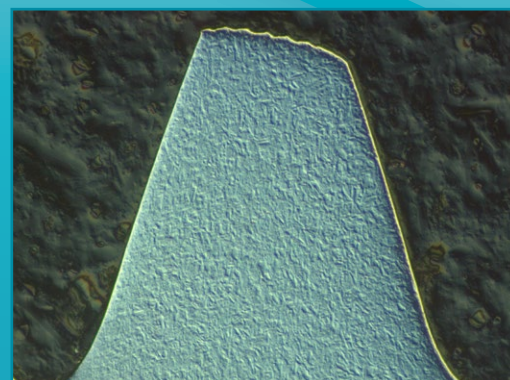
Our oxide polishing suspensions are mixed with an anti-drying agent. This will greatly delay the crystallisation of the suspensions on the polishing cloth. Dried-up suspensions can create large, hard agglomerates on the polishing cloth that can lead to severe scratching. Additionally, when the suspension is not allowed to dry in the dosing tubes of automatic dosing systems, valuable cleaning and maintenance time is saved. With our anti-drying suspensions, these risks are greatly minimised.



MLCC, BF, 500x after polishing with Alumina, Neutral.



Electronic component, DIC, 500x after polishing with Fumed Silica, Alkaline, with additives.



Stainless Steel, DIC, 100x after polishing with Fumed Silica, Alkaline.

Recommended applications and materials

Colloidal Silica	Fumed Silica	Alumina
Scratch-free result with a minimum of relief, low chemical reactivity	Scratch-free result with pronounced relief between phases, strong chemical activity	Scratch-free result without relief, no chemical activity
All materials Heterogeneous materials Copper and Cu alloys	Ductile materials Copper and Cu alloys Titanium and Ti alloys Superalloys Stainless steels	Minerals Carbides Ferrous metals Multilayer ceramic capacitors Other electronic components



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Polishing Cloths

Several different polishing cloths can be used for oxide polishing. However, because of the chemical activity of the oxide polishing suspensions, especially when mixed with active ingredients, the Chemal cloth is the preferred cloth. Chemal is resistant to most chemicals because it is based on synthetic foam. Due to the porous structure it can hold a relatively large amount of liquid.

When oxide polishing suspensions are used without additives the soft Napal cloth provides a perfect finish.

For the best possible flatness or edge retention our Silk or Daran cloths are recommended.

All our cloths are available with either magnetic (Mag-) or PSA (Aka-) backing.

			
Mag-Chemal / Aka-Chemal For chemical-mechanical final polishing of all materials	Mag-Napal / Aka-Napal For final polishing of all materials	Mag-Silk / Aka-Silk For final polishing of harder materials and coatings	Mag-Daran / Aka-Daran For polishing of all materials



Copper, DIC, 200x after polishing with Fumed Silica, Alkaline, with additives, on Chemal.



AISi, BF, 500x after polishing with Colloidal Silica, Alkaline, on Napal.

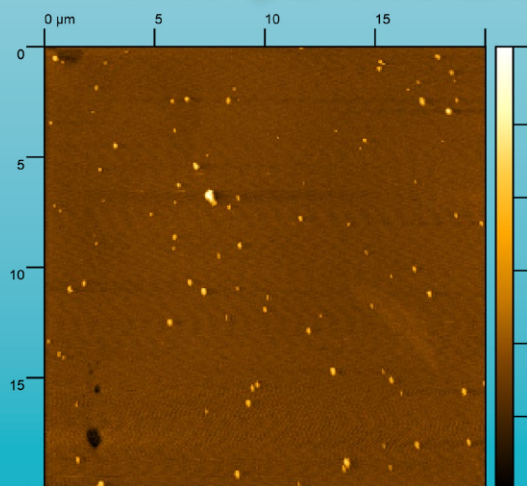


Oxide Polishing

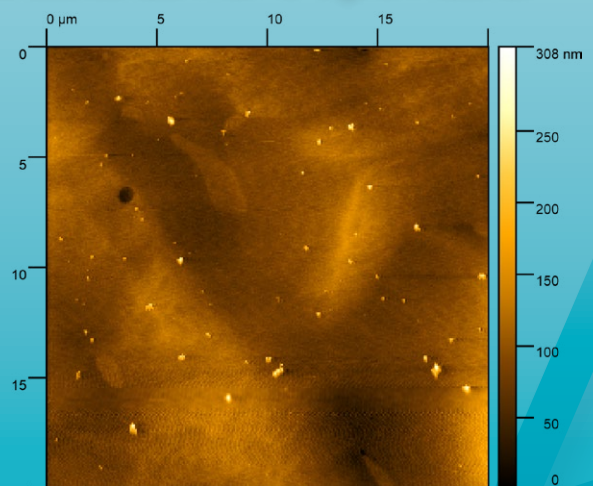
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High Quality Surface Finish

All the samples in this brochure have been prepared according to our Aka-Brief methods. These preparation methods are also optimised in terms of oxide polishing. For the quantification of the prepared samples and the optimisation of our products and preparation methods, we are using an AFM (Atomic Force Microscope). This allows measuring the prepared sample surfaces and, based on the results, creating the best preparation method by identifying the suspension with the highest removal rate and the best surface finish for a given material.



AFM image of a sample after polishing with Colloidal Silica. No scratches and no relief.



AFM image of a sample after polishing with Fumed Silica. No scratches but slight relief visible. Individual grains can be detected.

The images above show a comparison between a stainless steel sample polished with Colloidal and Fumed Silica respectively. The stronger chemical reaction of Fumed Silica produces more relief and shows the structure. Depending on the requirements of the metallographic examination, either one can be used.

The following overview shows the different types of oxide polishing suspensions and packing sizes available:

Oxide Polishing Suspension	1 l	5 l
Colloidal Silica Suspension 50 nm Alkaline	48161015	48161017
Fumed Silica Suspension 0.2 μm Alkaline	48123015	48123017
Fumed Silica Suspension 0.2 μm WF	48133015	48133017
Alumina Suspension 50 nm Neutral	48211015	48211017

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