AEROSIL® for Photo Inkjet Media

Evonik. Power to create.
Large-format inkjet printers for printing posters and other advertising materials

Evonik Industries developed AEROSIL® fumed silica more than 70 years ago and has played a key role in the world’s development and production of fumed silica ever since. Many things, as we know them in our daily lives, would be unthinkable with AEROSIL® fumed silica. For example, AEROSIL® fumed silica is found in earthquake-proof building foundations, in silicone sealing compounds for bath tubs, in plastic walls of yachts, in insulating materials for ceramic stove tops, and in paints and coatings. AEROSIL® fumed silica has become indispensable, not just as a product itself, but because the highly-specialized, environmentally-friendly technologies enabled by AEROSIL® products have become firmly rooted in numerous industries. In addition to our lineup of AEROSIL® grades, we offer real solutions for many technical applications, providing significant advantages.

Our Research and Development teams are highly specialized and continuously improve our products. Competent and dedicated laboratories work together with our customers to solve application problems and to improve handling techniques. Efficient logistics ensure on-time deliveries. Well-designed packaging solves technical handling problems before they can occur. Technical support and customer service are available worldwide. Our policy regarding the long-term availability of AEROSIL® products offers planning security and prevents unexpected investment costs for alternative solutions. In addition, our worldwide presence helps us to combine our expertise to form an international network. Our objective is to work hand in hand with our customers to provide customized solutions for their systems, to meet their high standards and to make their products even more successful.

AEROSIL® – more than just a powder

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Swellable or microporous systems?

The differences are clear

- **Instant dry**
- **Photorealistic resolution**
- **Brilliant colors**
- **Water-fast images**
- **Maintained Gloss Level**

**Swellable System**

Traditional polymer coatings absorb ink drops and the dye molecules dissolved in them by swelling up with liquid and then slowly drying again to lock in the dye. This process takes some time; consequently, the high speed of advanced inkjet printers may cause the colors to run together and diminish the image quality. If the printed image is exposed to high humidity or an excess of water, the dyes can become re-mobilized resulting in a degradation of the image. Ultimately in effect, these types of coatings are for the most part not water-resistant.

Many of today’s inkjet printers not only print with dissolved dye molecules, but also with ultrafine color pigments. These pigments are not able to penetrate into the polymer coating and remain on its surface, where they can often easily be wiped off by touching. The difference in gloss between the shiny polymer surface and the deposited pigments is also very noticeable. For good quality results, swellable papers should only be used with non-pigmented inks and at slow printer settings. Photographs printed with dye-based inks, however, tend to fade when exposed to light and air and therefore have only a limited life-span.

**Microporous System**

Microporous coatings consist of an inorganic sponge that has a well defined pore and channel structure. Because of their unique fractal structure, fumed metal oxides, like AEROSIL® fumed silica and AEROXIDE® fumed alumina, can form this sponge with a minimum of polymeric binder. When an ink droplet hits the surface, the coating absorbs the liquid in a fraction of a second. The “instant dry” performance benefits of microporous coatings enable the use of high speed printers while maintaining optimum image quality. Also, the extremely fine particles of AEROSIL® and AEROXIDE® products make them especially suitable for glossy coatings.

The dyes are absorbed on the surface of the solid particles (which are called pigments within the paper industry) with pin-point accuracy while the capillaries carry away the water, resulting in both brilliant colors and high resolution. Since the negatively charged dyes adhere to the positively charged (cationic) particles electrostatically, additional liquid is unable to dislodge them. As a result, the images are water-fast.

Beside the inorganic particles, microporous coatings consist of some organic binder, mostly high molecular weight and partially hydrolysed polyvinyl alcohol. This binder joins the particles mutually to each other and results in a strong but flexible connection of the whole coating to its substrate. Crosslinkers, such as boric acid and glyoxal-based resins, allow a reduction in binder content and the formation of a more open pore system enabling the formulation of superior water-resistant coatings.

Microporous inkjet media are receptive towards both dye and pigment based inks. Pigmented inks are increasingly used since they substantially improve the life time of photo inkjet prints.
AEROSIL® products offer the widest product line of fumed metal oxides on the market. Besides fumed silica, we also offer, under the brand name AEROXIDE®, fumed alumina, fumed titania, and various mixed oxides. This extensive selection of products also serves as a foundation for the manufacture of hydrophobic products, which can be used in a great variety of applications.

At the same time, these oxides serve as raw materials for the production of dispersions. The large portfolio of fumed oxides that Evonik has at its disposal permits us to meet special requirements and develop customized dispersions upon customer request. In addition, our modern dispersion equipment and expertise permits us to combine the characteristics of our powder products with the handling advantages that dispersions offer.

The fumed alumina AEROXIDE® Alu C, the mixed silicon-aluminum oxide AEROSIL® MOX 170 as well as its dispersion AERODISP® W 1714 have been used in the paper industry for many years.

Most recently, we have developed new powders and dispersions specially tailored for microporous inkjet paper coatings on different substrates and for different purposes. Today, we offer the fumed alumina dispersions AERODISP® W 630 and AERODISP® W 440, and the cationic fumed silica dispersions AERODISP® WK 341 and AERODISP® WK 7330 as easy-to-use and well dispersed liquid systems. For customers with an integrated dispersing unit we recommend AEROSIL® 200, AEROSIL® 255 and AEROSIL® 300 fumed silica as well as AEROXIDE® Alu C fumed alumina.

Along with our products, we also offer comprehensive expertise and know-how to our customers to convert raw materials into excellent inkjet media. Whether it is guide formulations, execution of applied technology tests, physical chemistry measurements or something else, contact us and let us help you develop innovative and high-quality products. Past experience has shown that simple questions often evolve into cooperation and customized solutions.
The optimization of the dispersion process with regard to interrelated variables like solids content, particle size and viscosity, ultimately leads to products that are easy and economical to process and that also achieve the best possible quality for the coatings. Our product developers can rely on more than 70 years of experience in manufacturing dispersions, solid understanding of colloid chemistry, and state-of-the-art equipment in our dispersion center.

The substrate to be printed can be just as versatile as the inkjet print itself. Whether it is CD labels, posters, photographic paper, or other special papers – at Evonik you will always find the right raw material for a microporous coating.

For high quality requirements and easy handling, we recommend the dispersion AERODISP® W 630, which contains a high surface area fumed alumina (concentration 30 wt. %) that carries a natural positive (cationic) charge. This results in excellent dye fixation and consequently water-resistant, high quality prints. Highest quality photo inkjet papers can also be produced using AEROSIL® 200 and AEROSIL® 300 fumed silica grades together with cationic polymers using a specially adapted dispersing process. Upon request and after a discussion of your needs, we can offer guidelines for the dispersing process and ready-to-use dispersions as a reference.

For other purposes, such as the production of high quality inkjet office papers, we recommend our cationic silica based dispersions AERODISP® WK 341 and AERODISP® WK 7330. The surface charge of the usually anionic silica surface is reversed using a unique cationic polymer. The choice of special polymer types and suitable dispersing conditions prevents flocculation while at the same time stabilizing the system at an acidic pH. This modification leads to strong dye/pigment bonding, resulting in brilliant colors and high water-resistance.
Handling
The term “handling” is used to describe the techniques required to move AEROSIL® products within a customer’s plant. The following topics should be regarded as main priorities:

- emptying of packaging units
- silo/tank storage
- internal conveying
- dosage
- introduction of the material into the manufacturing process

In addition, handling includes everything that is required to perform the steps above. More detailed information about this topic is available from the customer service agent in your area.

Packaging
AEROSIL® dispersions, known as AERODISP®, come in 60 kg containers (not available in all regions), 220 kg drums and 1000 kg IBCs (Intermediate Bulk Containers).

AEROSIL® fumed silica and AEROXIDE® powders are available in three kinds of packaging. The standard packaging is a multi-layer paper bag, with an additional polyethylene coating on one layer. The paper bags contain between 10 and 20 kg, depending on the AEROSIL® grade and its tapped density. Evonik also offers AEROSIL® fumed silica in semi-bulk packaging – the FIBC (Flexible Intermediate Bulk Container). Depending on the product and its densification, the weights of the filled FIBCs may also vary. Large-scale users may also have the product delivered by bulk truck, which requires a suitable storage at the customer’s site.

Dispersion Logistics
Frost-sensitive aqueous dispersions are shipped in temperature-controlled trucks during cold weather seasons, in order to protect them from freezing. Depending on the region additional thermal insulation packaging may be used. In winter these precautions effectively protect the products from freezing during shipping and short interruptions in the transportation chain.
The Advantage of a Global Enterprise – Local Proximity

Size usually creates distance – but not at Evonik. As a leading specialty chemicals company Evonik relies on the business philosophy: “as decentralized as possible, as centralized as necessary”. The decentralized organization at all levels and in all divisions of the company is tailored to operative units which can respond to the market quickly, flexibly and on a customer-oriented basis. As a brand operating worldwide, AEROSIL® uses production facilities, application-related service centers, research centers and commercial and technical service offices in all regions of the world.

The mere fact that we produce on 3 continents represents a decisive advantage for us and our customers when it comes to an effective world-wide delivery service. With a total of more than 1200 motivated employees and more than 100 service offices in 95 countries, we also offer our customers the biggest service network of all suppliers on the market.

The combination of highest product quality and a marked focus on service and consulting is a major cornerstone of the AEROSIL® strategy. As a brand that is active worldwide we also want to combine with partners to form a strong, international network in which we concentrate our areas of expertise.

A functioning globality, which our customers experience on a local level.

Always close by.
Detailed information regarding our technical literature can be obtained from:

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Product Overview and related Literature

Product Overview AEROSIL®

Industry Brochure Dispersions

Technical Overview

• AEROSIL® - Fumed Silica

Technical Information No. 1278

•  Handling of AERODISP®
  Fumed Silica and Fumed Alumina
  Dispersions

Technical Information No. 1322

•  Paper Sizing with AERODISP®
  Fumed Silica Dispersions

Technical Information No. 1331

•  AEROSIL® - Fumed Silica and
  AEROXIDE® Fumed Alumina
  for Glossy Photo Inkjet Media

Technical Information No. 1357

•  AERODISP® Fumed Silica
  as an Anti-Slip Agent for Paper Bags

Industry Information 2243

•  Products for the paper and film
  industry

Plain Paper Sizing – Evonik’s New Approach to Improving the Inkjet Print Performance of Uncoated Papers

At the high end of the inkjet media market, glossy photo-realistic inkjet papers are using the benefits of AEROSIL® fumed silica and/or AEROXIDE® fumed alumina based microporous paper coatings in terms of instant dry times, high water-fastness as well as excellent color gamut and picture resolution. This approach which emphasizes the benefits of a microparticle network can also be used for everyday paper products such as office and printing papers.

The addition of AERODISP® fumed silica dispersions to the surface sizing process substantially increases the ink absorption and immobilization of nearly all types of plain paper.

Combined with binders commonly used at the size press, such as polyvinyl alcohol or starch, AERODISP® fumed silica dispersions enhance:

- Color brilliance (gamut and optical density)
- Print uniformity (mottle & grain)
- Print resolution (line growth, raggedness & blur)
- Water fastness
- Coefficient of friction.

The thin fumed silica coating behaves like an inorganic sponge with a well defined void and capillary structure to absorb and immobilize ink. AERODISP® fumed silica dispersions are extremely efficient – coat weights of as little as 0.5 – 1.0 g/m² are sufficient to achieve these performance characteristics. They are compatible with most sizing formulations and equipment.

Sizing formulations containing AERODISP® fumed silica dispersions can be applied with a puddle or metering type size press, a gate roll or calendar box. We recommend our AERODISP® WK 7380 for this approach, but other types of fumed silica dispersions work as well. Please see our Technical Information No. 1322 for more detailed information.

Coated or uncoated
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