CABOT

FUMED METAL OXIDES

CAB-O-SPERSE® DISPERSIONS
FOR INK RECEPTIVE COATINGS ON NONPOROUS SUBSTRATES

APPLICATION GUIDE

Why CAB-O-SPERSE dispersions in ink receptive coatings?

The function of an inkjet receptive coating is to allow an inkjet compatible layer to sit on top of substrates that are either too porous or too non-permeable to be coated with other types of formulations.

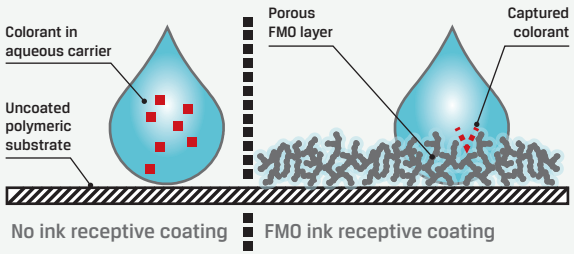
CAB-O-SPERSE fumed silica or alumina aqueous dispersions enable key performance benefits for this application including:

1. Improved and consistent performance:
- High absorptive capacity
- Fast drying characteristics
- Good substrate adhesion
- Excellent image quality and gloss

2. Processing ease:
- Pre-dispersed particles allow easy incorporation
- CAB-O-SPERSE products can be selected to optimize stability in formulation

3. High purity:
- Good chemical and temperature stability without yellowing
- Dispersant-free to minimize incompatibility and aid formulation flexibility

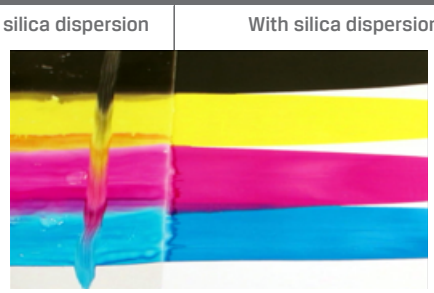
The unique morphology and surface charge of our silica and alumina particles determines the beneficial properties imparted to nanostructured ink receptive coatings. The porosity, pore size distribution, and surface charge of the coating – which are critical for coating adhesion, ink and coating drying time, ink capacity, color intensity, color gamut, and dot gain– can all be tailored by formulation and choice of materials.



Water management: enhance drying

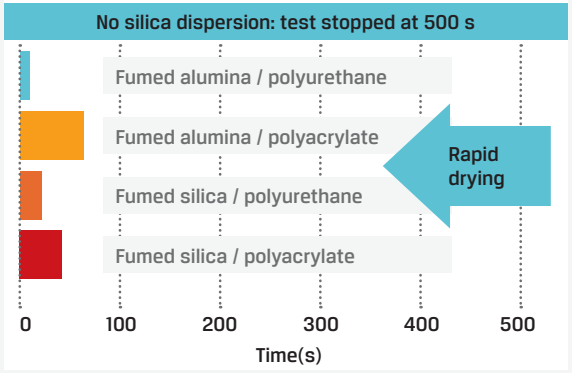
CAB-O-SPERSE dispersions in coatings formulations create submicron pores, which decrease the drying time exponentially due to the Kelvin effect, resulting in orders of magnitude faster drying, faster print speeds, and less energy spent drying the coating and printed image.

Finger wipe after 45 seconds



With CAB-O-SPERSE silica dispersion in the coating formulation, the coating and ink dries in seconds. Without the addition of CAB-O-SPERSE dispersion, drying takes hours (and hours).

Ink drying time

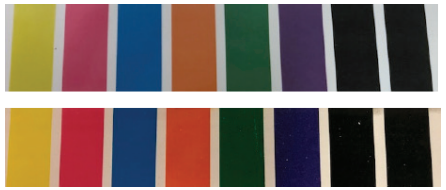


Substantially improved color gamut

The control over pigment or dye spatial deposition enabled through adding CAB-O-SPERSE dispersions to the formulation results in significantly increased color gamut in the final printing/coating. This enables custom color printing and brand extension.

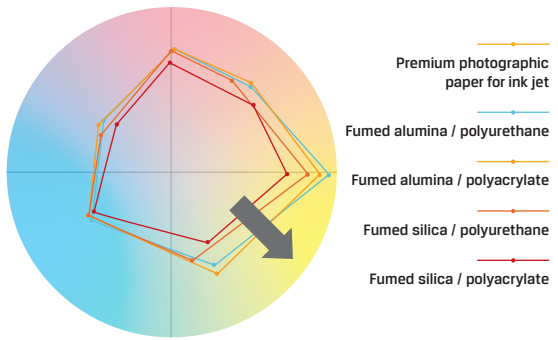
- The porosity of the coating is determined by the fumed silica/alumina to binder weight ratio.
- Coating pore size gives pigment or dye spatial control on a nanoscale level.
- Fumed silica/alumina-to-binder ratio gives formulators control over coating morphology.

Total gamut in test formulation*



In the order of : Y M C O G B K K(CMY)
Top row: Premium photographic paper for inkjet
Bottom row: Fumed silica - polyacrylate

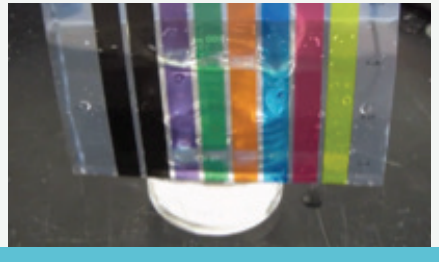
Color gamut a* b* plot



Color retention in water

Ink receptive coatings formulated for paper substrates are not waterfast on nonporous substrates due to presence of water soluble binders such as polyvinyl alcohol. However, with appropriate resins, printed images are able to **retain their entire color gamut**, even after immersion in water for ten minutes.

Demonstration of color fastness in water on nonporous substrate without CAB-O-SPERSE dispersions in substrate coating



Demonstration of color fastness in water on nonporous substrate with CAB-O-SPERSE dispersions in substrate coating

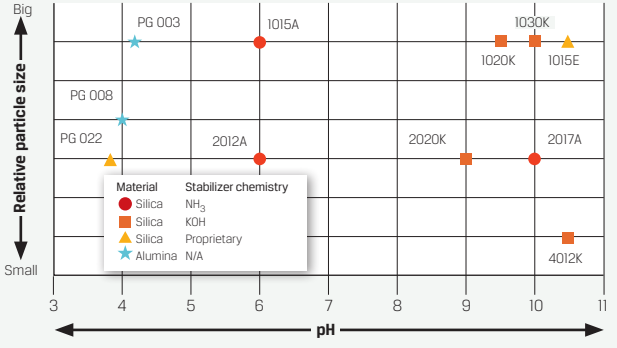
Watch the videos online at:
http://www2.cabotcorp.com/cabosperse-coatings

Sample ink receptive coating formulations*

A high performing ink receptive coating needs to have two major components:

- A porous structure forming agent to handle liquid: CAB-O-SPERSE fumed silica/ alumina dispersions are excellent porosity formers
- A charge diminishing mechanism to fix the pigment particles: CAB-O-SPERSE grades provide surface charges that can effectively alter the stability of color pigment

CAB-O-SPERSE product	Silica / alumina Loading	Charge
1015A	15%	Anionic
1015E	15%	Cationic
1020K	20%	Anionic
1030K	30%	Anionic
2012A	12%	Anionic
2017A	17%	Anionic
2020K	20%	Anionic
4012K	12%	Anionic
PG003	40%	Cationic
PG008	40%	Cationic
PG022	20%	Cationic



The wide range of CAB-O-SPERSE products provides ample options to optimize formulations.

- High compatibility because there are no dispersants
- Range of materials: Silica or alumina base
- Wide range of particle size
- Controllable surface charge via choice of particles or pH
- Robust dispersion: high zeta potential over range of pH

Some formulation best practices to consider:

- Establish film and print quality based on the example starting formulation on the right, then adjust if needed to balance coating quality and print performance
- Avoid using a particle dispersion with a resin with opposite charges; neutral resins can be used with either positively charged or negatively charged particle dispersions

Example Inkjet Receptive Coating Formula*

Composition	dry basis (wt%)
CAB-O-SPERSE silica or alumina dispersion	50
Resins as binders for particles and for adhesion to substrate	50
Surfactant to help spreading, defoaming, lubrication or film formation as needed	0-1

Resin type	dry basis (wt%)
Neutral	Starch, partially hydrolyzed polyvinyl alcohol
Anionic resin	Various anionically charged polyurethane dispersions or acrylic dispersions (for examples, Ottopol S 30 acrylic emulsion and Sancure™ 2710 polyurethane dispersion)
Cationic resin	Cationic polyurethane dispersions or acrylic dispersions (for examples, Sancure™ 20051 dispersion and Ottopol K23 acrylic polymer)

*Formulation notes for CAB-O-SPERSE® dispersions:
Untreated fumed alumina is cationic and stable between pH 4-9 (CAB-O-SPERSE 003 and 008 products)
Untreated fumed silica is anionic and stable between pH 4-10 (CAB-O-SPERSE 1030K and 4012K products)
Treated fumed silica (CAB-O-SPERSE PG 022 product) is cationic at pH 2-5, and anionic at pH 7-10
'Loading' percent values are dry weight in final coating
Formulations were mixed using a Flack Tec DAC150 Speedmixer™ apparatus at 3500 rpm for 3 min after the addition of each new component.

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