

# Orgacon™ Orgacon DRY

## Product information

### Dispersing ORGACON™ Dry

#### [1] INTRODUCTION

Agfa recently introduced "ORGACON™ DRY". The pellets are obtained by a proprietary drying process and consist mainly of pure organic conductive polymer PEDOT/PSS.



Orgacon DRY

Unlike with common aqueous PEDOT/PSS dispersion, more flexibility is now offered for the formulation in non-waterborne system, pushing the limits of PEDOT/PSS formulation with organic solvents. The technology is optimized to allow retention of PEDOT/PSS key properties in polar organic solvents.

The dispersion of ORGACON DRY is described in this leaflet. A selection of applicable dispersing technologies, solvents and analytical tools will be addressed.

#### [2] ORGACON DRY

Typical properties are:

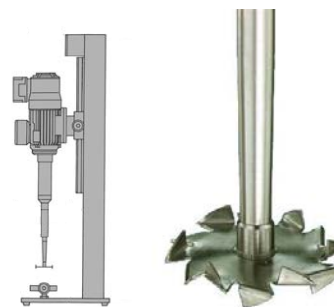
Visual appearance	Blue-grey pellet
Specific Surface Area (BET value)	> 5m <sup>2</sup> /g
Surface resistance*	< 170 Ohm/sq

\* 40µm wet coating dried 3'@130°C of 1,2wt% DRY re-dispersed in water with DEG added

#### [3] DISPERSING TECHNOLOGY

The dispersing of ORGACON DRY can best be performed in a 2 step approach: a pre-dispersion for disaggregation and wetting followed by a finishing step.

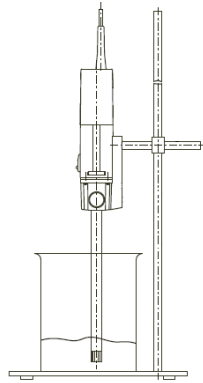
For the pre-dispersion 2 technologies can be recommend: ULTRATURRAX (eg 5'-10'@11000rpm with Ultraturrax T45) or DISPERLUX (5 cm dispersing disk, 30'@1000-2000rpm)



DISPERLUX and dispersing disk.

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## Conductive Transparent Films



ULTRA-TURRAX

For dispersing the particles well below 1µm (finishing step) a second high energy homogenization treatment is required. This can be performed by high energy ultrasonic treatment (e.g. Vibracell 400 – 750W, 20'@80% amplitude), by a wet-milling process or by high pressure homogenization. The former process is recommended in the design phase (<250g) while for production, wet-milling or high pressure homogenisation are advised.



Vibracell 400

For the wet-milling process and for batches between 0.5 and 1.0 kg, the NETZSCH MINIZETA (900 g of 0.4 mm YTZ pearls, 13m/s) or the WAB Dynamill Multilab (1283 g of 0.4 mm YTZ pearls, 8m/s) can be used.



NETZSCH MINIZETA



WAB Dyno®-Mill MULTILAB

For the high-pressure homogenization process and for batches comprised between 0.5 and 1.0 kg, the MICROFLUIDICS™ M-110F Laboratory Microfluidizer® can be used (450 bar, 1 pass).



MICROFLUIDICS™ M-110F Laboratory Microfluidizer®

#### [4] CHOICE OF SOLVENTS

The following solvents mixtures are successfully tested. The loading of ORGACON DRY was 1wt%.

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Nr	Orgacon DRY/Solvent (1/x)	Wt%
1	Water	99
2	EtOH/water	94/5
3	IPA/EtOH/Dowanol PPH	96/2/1
4	IPA/EtOH/water	92/2/5
5	IPA/EtOH	97/2
6	NMF	99

Example Nr 3: 8 g Ethanol, 4 g Dowanol PPH (methoxy propanol, Dow Chemical) and 384 g of isopropanol (IPA) are stirred for 1 minute @ 400 rpm in a stainless-steel reactor (11 cm internal diameter) by using a Disperlux disperser equipped with a 5 cm dispersing disk. 4 g of ORGACON DRY pellets are added to the reactor and stirred @ 1500 rpm for 30 minutes at room temperature. Next the mixture is transferred to the NETZSCH MiniZeta for 54 minutes @ 3000 rpm under recirculation mode, which results in a water-free and aggregated-free IPA dispersion.

Example Nr 4: Same procedure as in example 3 with the replacement of 4 g Dowanol PPH by 20 g deionized water. This formula contains a small portion of water (5%).

Example Nr 5: 8 g Ethanol and 388 g of isopropanol (IPA) and 4 g of ORGACON DRY pellets are pre-dispersed for 10 minutes @ 11000 rpm (50% power) in a stainless-steel reactor (11 cm internal diameter) by using a Ultra-turrax T45 disperser. The pre-dispersion should be cooled during the treatment with a water bath (or by using a reactor equipped with a double-jacket). Finishing step is operated on the NETZSCH MiniZeta similarly to example 3. It results in a water-free formulation, free of wetting agents.

### [5] ANALYSIS OF DISPERSIONS

Laser diffraction (Coulter LS 13320) measures coarser particles (diameter > 1µm) and is well suited to monitor the quality of the pre-dispersion step.

The final dispersion after the high shear homogenization can be qualified most easily by a filtration test. More advanced is measurement of particle size and particle size distribution via CPS Disk Centrifuge. The number of aggregates can be analysed with the Accusizer/multisizer, which counts particles above a given diameter for a given volume.

### [6] APPLICATION EXAMPLES

The resulting dispersion can be used in coating- or ink-formulations targeted for different applications as:

- Antistatic applications, e.g. UV hard coats
- Coating formulations for the transparent conducting films
- Ink Formulations, such as flexography-, ink jet-, gravure- or screen inks

Specifically useful for low water compatible formulations, such as UV curable monomer and pre-polymer based formulations.

### [7] HYGROSCOPIC PROPERTIES

The TGA of Orgacon DRY shows from 20°C up to 100°C +/-20% weight loss. The T- region from 100-200°C is stable.

Orgacon DRY is hygroscopic and will absorb water in high R.H.

Absolute H<sub>2</sub>O uptake @22°C

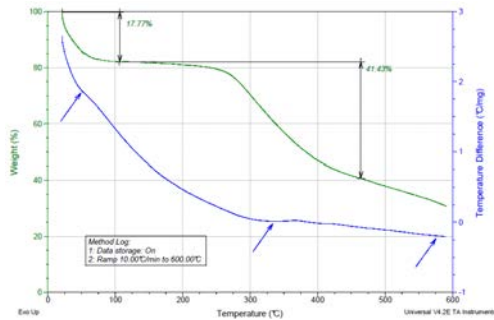
- 50% RH = 10-14mg /100mg
- 80% RH = 37-39mg/100mg

The equilibrium is reached fast (<1hr); No effect on re-dispersing properties were observed.

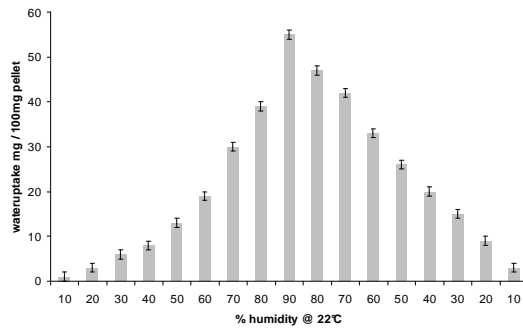
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## Conductive Transparent Films

If water content in your final formulation is important, it is highly recommended to condition (pre-dry) the Orgacon DRY at the desired relative humidity.



TGA of Orgacon DRY



Water release and uptake vs R.H.

### [8] MORE INFORMATION

Please, contact Agfa Gevaert NV

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