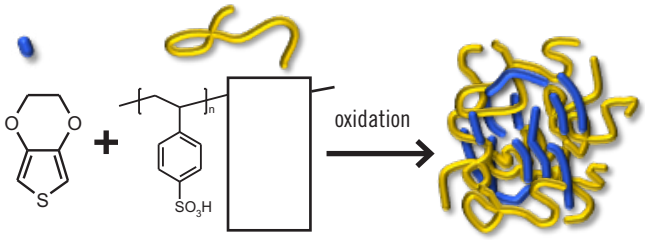
Solvent-Based Clevios™

Waterless conductive polymer for solvent-based polymer systems

Polythiophene
(Clevios™ P SB 12)
dispersed in ansiol/butanol

New polythiophene-based systems from Heraeus Epurio:

- Waterless, non-aqueous, intrinsically conductive, transparent polymers
- Antistatic / dissipative effect (< 10 E9 Ohm/sq) at low dosage (< 3%)
- Compatible with many polymer systems such as polyacrylates



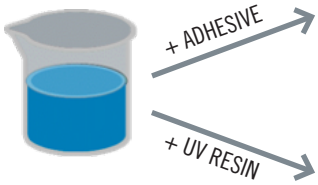
Monomer Polymeric counterion Polythiophene complex

Solvent compatibility	Clevios™ P SB 6	Clevios™ P SB 12
Sheet resistance (Ohm/sq) of undiluted polythiophene	1 x 10^4	2 x 10^5
PGME	No	Yes
Butylbenzoate	Yes	Yes
Isopropanol	No	Yes
PGMEA	Yes	Yes
Ethanol	No	Yes
Toluene	Yes	Yes
Butylacetate	Yes	Yes
Ethylacetate	No	Yes

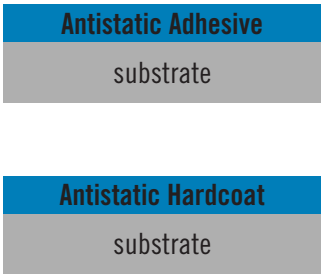
Solvent compatibility of water-free polythiophene dispersions

Solvent-Based Clevios™ Formulations

Antistatic properties of solvent-borne hard coat and adhesive formulation



Clevios™ P SB



Clevios™

< 10^9 Ohm/sq

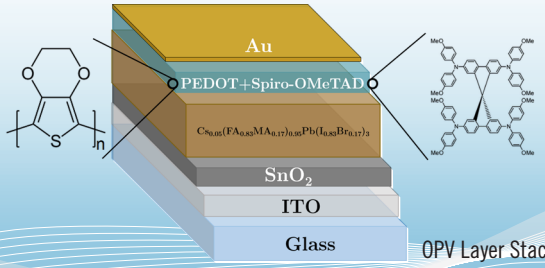
- Electronic conductivity
- High optical transmission

New solvent-based Clevios™ can add antistatic functions to adhesive and hard-coating formulations

Solvent-Based Clevios™ for Solar Cells

Perowskite solar cells require waterless hole-transport layers

- **Clevios™ HTL Solar 3 and 4 are waterless, solvent-based polythiophene dispersions that can be coated on the perowskite layer:**
  - High transparency and conductivity compared to traditional hole-transport layers
  - Facile processing
  - Waterless, non-aqueous



OPV Layer Stack

CLEVIOS™	Solvent	Resistivity
HTL Solar 3	waterless, in toluene, acidic	1 – 1k Ω·cm
HTL Solar 4	waterless, in anisole, non-acidic,	1 – 1k Ω·cm

Clevios™ HTL Solar 3 and 4

PV performance	
J_{SC} [mA/cm²]	21.6
V_{OC}[V]	1.19
FF	0.73
PCE[%]	18.7

Reference
Kegelmann, Lövenich et al. ACS App. Mater. Interfaces (2019), 11, 9172