Ferroelectric Ink for Organic Electronics

Piezotech FC™ ink H

- Processing guide –

Technical Data

Technology	**Solvent casting / spin coating**	Thickness range (µm)	Doctor blade: 3 – 80 Spin-coating: 5 - 20
Bas polymer	Piezotech FC 25	Viscosity (mPa.s)	2300
Curie Temp. (°C)	112 - 123	Base Solvent(s)	MEK
Melting Temp. (°C)	150	Typical dry content value (%)	20
Annealing Temp. (°C)	135	Boiling Point (°C)	78 - 82

Printing Data

Thanks to the high purity of the ink, devices obtained with Piezotech FC ink H provide easy evaporation of the solvent and uniform thickness of the film.

Precautions

- Substrate cleaning is a key point to obtain a high quality film. It is possible to use solvents as acetones, ethanol and complete it with a 3mn UV ozone treatment
- In order to avoid bubbles, it is preferable to not use syringe
- For spin-coating, Drop casting slowly the ink in all substrate surface before rotation is a good way to provide good film quality and good thickness uniformity

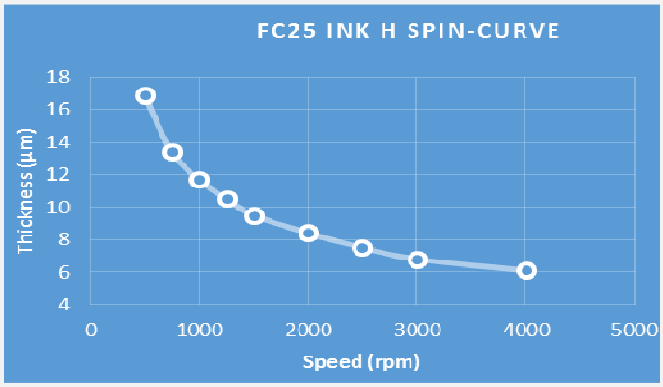
Spin-coating

Materials

- Polymer: Piezotech FC 25 ink H
- Substrate used for data acquisition: glass

Process parameters

- Step 1 :
  - Ramp = 4s
  - RPM = 500 to 4000 rpm
  - Dwell = 60s
- Step 2 :
  - Ramp = 2s
  - RPM = 0
  - Dwell = 0



Piezotech FC 25 ink H spin curve

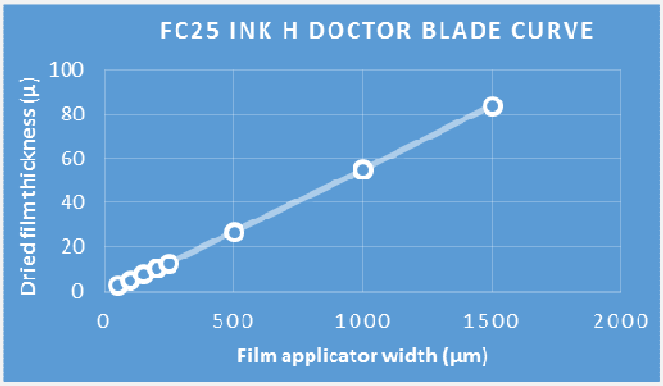
Doctor blade coating

The film thickness obtained depends on the applicator width. The curve present the thickness of the dried film as a function of the coater width.

FC25 Ink H is also adapted for film applicator with micrometer, baker type film applicator and wire bar coater.

Materials

- Polymer: Piezotech FC 25 ink H
- Substrate used for data acquisition: glass
- Traverse speed: 50mm/sec.



Piezotech FC 25 ink H Doctor blade curve

Post-printing Treatment

Annealing

After deposition, the layer has to be annealed above the Curie Transition Temperature to increase crystallinity and performances.

Typical Process

Solvent evaporation: 80°C / 3mn / hot plate

Crystallization: 135°C / 15mn / Infrared oven

Other possibilities

Vacuum for solvent evaporation and Conventional oven for the annealing step.

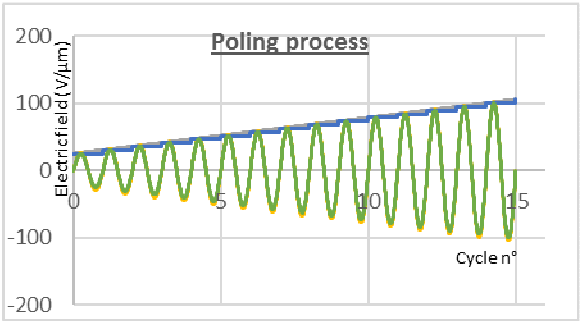
Poling

In order to acquire its piezoelectric properties, the ferroelectric layer has to be poled by applying a voltage above the coercive field.

Typical Process

The electric field can be applied according to (when voltage generator is coupled with signal generator):

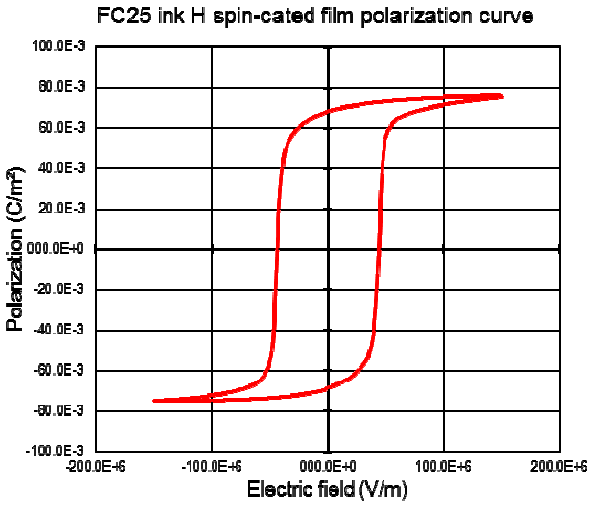
- Number of cycles to reach E_{max}: 15
- Frequency: 0,5Hz (higher is possible)
- Signal: sinusoidal
- $E_{max} > 2E_c$
- Typically E_{max}=100V/µm



Poling can also be carried out by applying a constant electric field (after a progressive rise) for a few minutes while heating the sample

Typical properties for a poled film obtained from Piezotech FC25 ink H

Relative dielectric permittivity, ε_r (1kHz)	12	Remnant polarization P_r (mC/m²)	70
Piezoelectric coefficient d_{33} (pC/N or pm/V)	-26	Coercive field (V/µm)	45
Pyro-electric coefficient, ρ, (µC/m².K)	-22	Dielectric strength (V/µm)	400



Typical polarization curve obtained with the printed Piezotech FC ink H

Safety and Storage

Please refer to the safety datasheet

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