innoLAE 2020

22-25 February 2021
Online

Wet and Dry Processing Technologies For Large Area Electronics

IMI Europe is pleased to be partnering with the University of Cambridge, providers of the innoLAE (Innovations in Large-Area Electronics) Conference, to provide two short courses on fabrication and processing technologies on the day preceding the innoLAE 2021 conference.

Wet Processing Technologies for Large Area Electronics

The Wet Processing Short Course is delivered by Printed Electronics Ltd (PEL) and the Centre for Process Innovation (CPI). It covers the inks and printer technology required for deposition techniques including screen, inkjet and flexo/gravure printing. The short course also covers coating techniques such as doctor blade and slot die, drawdown, spin and spray coating. In each case the advantages, disadvantages and technological challenges of each technique will be covered, along with issues arising in scale up for manufacture.

Dry Processing Technologies for Large Area Electronics

The Dry Processing Short Course is delivered by the Centre for Process Innovation (CPI). It covers the key processing techniques required for large area electronic device manufacture, including vacuum deposition, photolithography, laser ablation and wet and dry etching. In each case the advantages, disadvantages and technological challenges of each technique will be covered, along with issues arising in scale up for manufacture.

Wet Processing Technologies for Large Area Electronics

Monday 22 February 2021

08:00 – 09:00 Registration
09:00 Course begins

Wet Processing (Formulation, Coating and Printing) - PEL and CPI

Materials and Formulation - CPI

- Inks
  - Silver, copper, carbon and other ink materials
- Formulation
  - Rheology
  - Solvent-based inks
  - Curable inks
  - Ink formulation components
  - Mixing and scale-up
- Substrates
  - Polymers, glass, paper, textiles and metals

Printing - Printed Electronics Limited (PEL)

- Inkjet
- Screen print
- Other print technologies such as flexography, gravure etc.

11:00 - 11:30 Coffee break

Large Area Coating Methods - CPI

- Batch coating
  - Drawdown and dip
  - Spin coating
- Continuous processes
  - Doctor blade
  - Spray coating
  - Slot die
  - Scale-up for continuous processes
- Applications of large area coating

12:30 Course ends

Speakers

Nicola Broughton, Senior Scientist

CPI, UK

Nicola is a Senior Scientist working on collaborative and commercial research projects in the field of printable electronics. With a background in cell biology, Nicola has worked as an industrial laboratory chemist developing new products and formulations for an aerosol manufacturer. At CPI Nicola has worked to develop functional ink formulations, particularly those containing nanomaterials. She also works to establish coating, printing and curing methods for a number of different applications including IoT enabled devices, wearable electronics and sensors.

Dr Rob Valentine

CPI, UK

Dr Rob Valentine graduated from University of Durham with an MChem before undertaking a PhD at the University of Edinburgh in the Synthesis and Characterisation of Novel Organic Electronic Materials. Following these postgraduate studies Rob joined CPI in 2012 where he has been ever since. During his time at CPI Rob has developed particular expertise in a range of topics including OTFT, Photovoltaics and Sensor Technologies covering areas such as material formulations, deposition techniques and device architecture.

Dr Neil Chilton, Technical Director

Printed Electronics Limited, UK

Neil has more than twenty years' experience in the field of electronics and electronic components. After completing his BSc and PhD in Physics, his technical career took him to Japan where he worked for four years at the advanced materials research division of Nippon Steel Corporation. After returning to the UK he joined Europe's then largest printed circuit board manufacturing company where he was later part of an MBO team and technical director. In 2006, together with co-founder Dr Steve Jones, he started Printed Electronics Limited to focus on the practical use of inkjet for manufacturing electronic interconnects, devices and systems.

Dry Processing Technologies for Large Area Electronics

Monday 22 February 2021

12:30 – 13:30 Registration
13:30 Course begins

Dry Processing (Thin Film Fabrication and Patterning) - CPI

Vacuum Deposition - CPI

- Physical vapour deposition
- Chemical vapour deposition
- Description of evaporation process
- Description of sputtering process
- Comparison of evaporation vs sputtering
- PVD chamber design
  - Requirements for a process chamber
  - Discussion on vacuum pumps types
  - Discussion on power supplies
- PVD process conditions
  - Pressure, time & power vs deposition rate & thickness
  - Magnetron sputtering
  - Metal vs reactive sputtering
  - Target types
- Description of ALD process
  - ALD cycle
  - Temporal vs spatial ALD
  - Current tool types

Photolithography Processes - CPI

- Photo processes
  - Positive and negative resists
  - Lift off resists
  - Image reversal resists
  - Cured dielectrics
  - Hard mask process
  - UV-NIL

Photolithography Processes - Continued

- Photo tool set
  - Spin Coating
  - Alignment
  - Maskless photolithography
  - Developing photoresist
- Common issue considerations
  - Resist adhesion
  - Reflectivity of the material or underlying material
  - The planarity of the material
  - Etch characteristics of the material
  - Resist removal method
  - Thermal stability of sublayers and deposited material
  - Exposure factors

14:50 - 15:20 Coffee break

Laser Processing for Ablation and Patterning

Etching Processes - CPI

- Differences between wet and dry etching
- Isotropic versus anisotropic
- Typical wet etch chemistries
- Typical wet etch problems
- Plasma etch fundamentals
- Selectivity, etch rate, uniformity
- Steps in a plasma etch process
- Typical plasma chemistries

Integration - CPI

- Brief overview of the CPI integration facility
- Case studies

17:00 Course ends