Atmospheric Processing Platform

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Atmospheric Processing Platform

- 6”x6” substrates
- Inkjet deposition
- Spray deposition
- Sputter deposition
- Evaporation
- Rapid thermal processing
- XRD analysis
- XRF analysis
Atmospheric processing in PV

Wafer-Silicon

Inkjet printing

Ag fingers

$\text{Si}_3\text{N}_4$ - Anti-Reflection coating

Si p-n junction

Al back contact

Also: Printing of dopants to form junction
Atmospheric processing in PV

CIGS

Inkjet printing

Ni/Ag contact grid

ZnO (TCO) / CdS

CIGS absorber layer

Mo back contact

Glass substrate

Inkjet printing or Spray Deposition

CBD
Atmospheric processing in PV

OPV

- Inkjet and ultrasonic spray produce devices comparable to spin coated for both the HIL and the absorber.
- Devices scale up in air to 1 cm² with efficiency greater than >2%
  - Setting up deposition system in glove box for increased device performance

PEDOT:PSS Deposition

Active Layer Deposition

• OPV
Sprayed or printed:
  • hole blocking layer
  • absorber
Printed contacts

• CdTe
Sprayed Absorber
CBD CdS
Sprayed Contacts

• And more…
Glovebox system

Custom Gloveboxes by Mbraun

Linear motion system for sample transport between boxes
Inkjet and Spray

Custom inkjet and spray system by iTi
Build into glovebox
Universal X-Y platform
Multihead inkjet system
Multihead spray system
Systems interchangeable
Rapid Thermal Processing

RTP by Surface Science Integration

Build into glovebox

Up to 1250°C @ 150°C/s

3 process gasses
XRD and XRF

Compositional Analysis
XRF by Matrix Metrologies

Structural Analysis
XRD by Bruker

High throughput analysis
Vacuum Cluster

Cluster and chambers by MVSystems

Multi source sputter chamber

Multi source evaporator with glovebox access for air sensitive materials
Atmospheric Processing Platform

- All major component have been ordered

- Estimated delivery major components: September-November

- Partial operation:
  - Glovebox system: November
  - RTP: November
  - Inkjet + Spray: December
  - XRD + XRF: December
  - Sputter + Evaporator: January 2009

- Full integrated operation: February 2009

- Interest from industry:
  - All current CRADA partners
  - Many others in all areas
# M&C PDIL Capabilities

**Pete Sheldon**

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