

# Atmospheric Processing Platform

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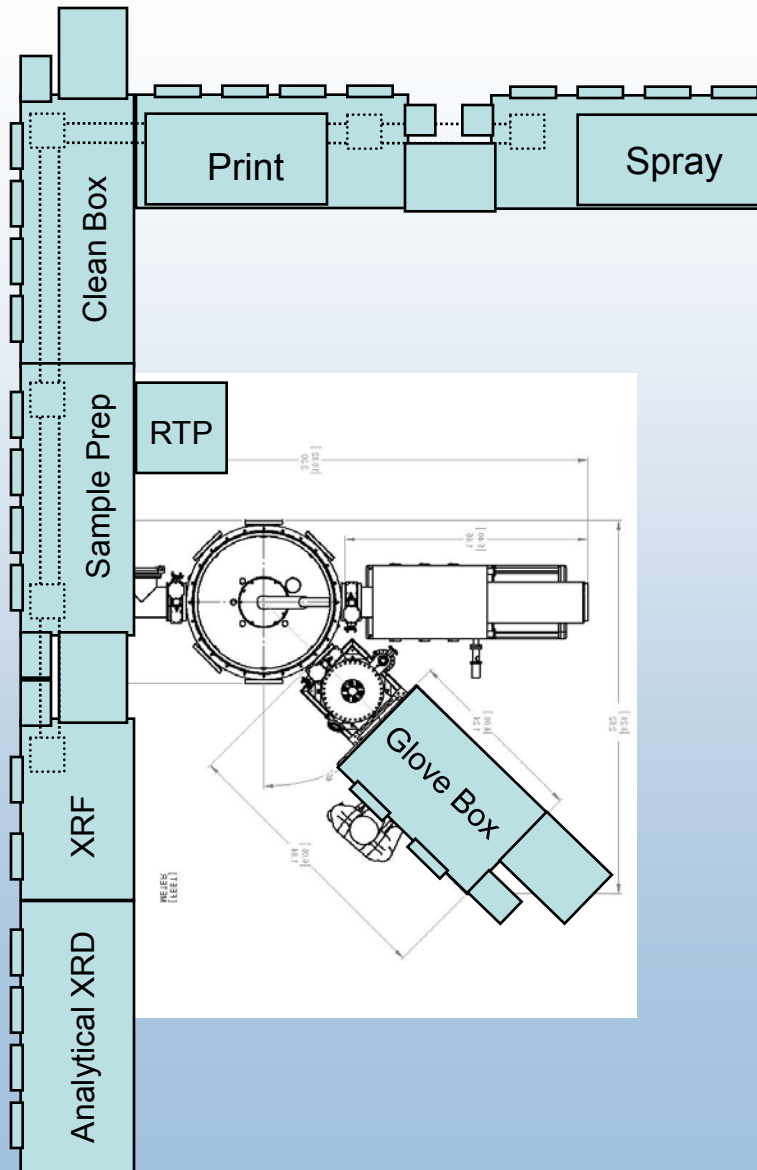
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# Atmospheric Processing Platform



6"x6" substrates

Inkjet deposition

Spray deposition

Sputter deposition

Evaporation

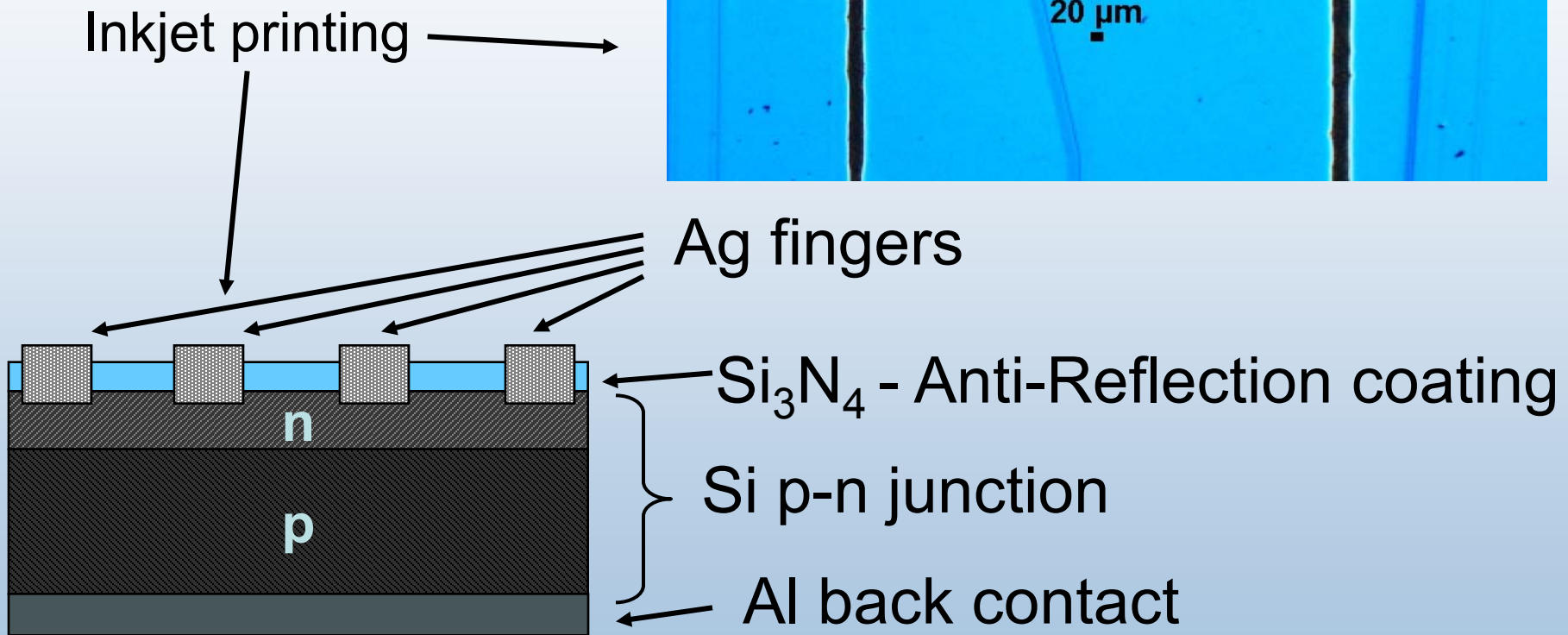
Rapid thermal processing

XRD analysis

XRF analysis

# Atmospheric processing in PV

Wafer-Silicon

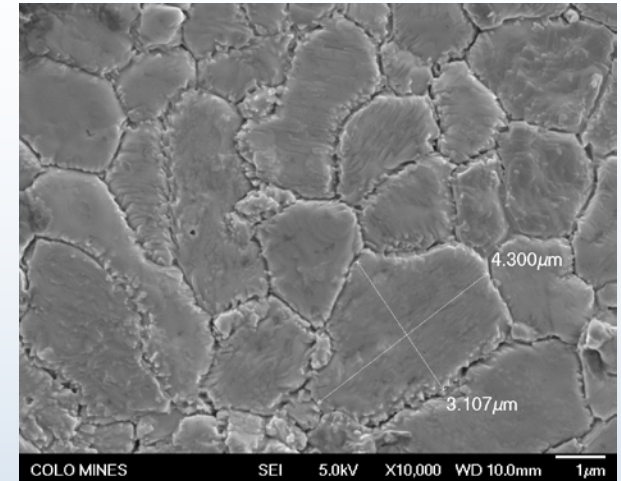
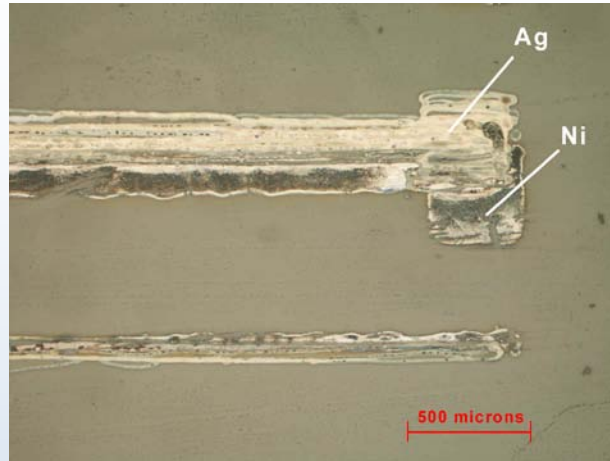


Also: Printing of dopants to form junction

# Atmospheric processing in PV

CIGS

Inkjet printing



Inkjet printing or Spray Deposition

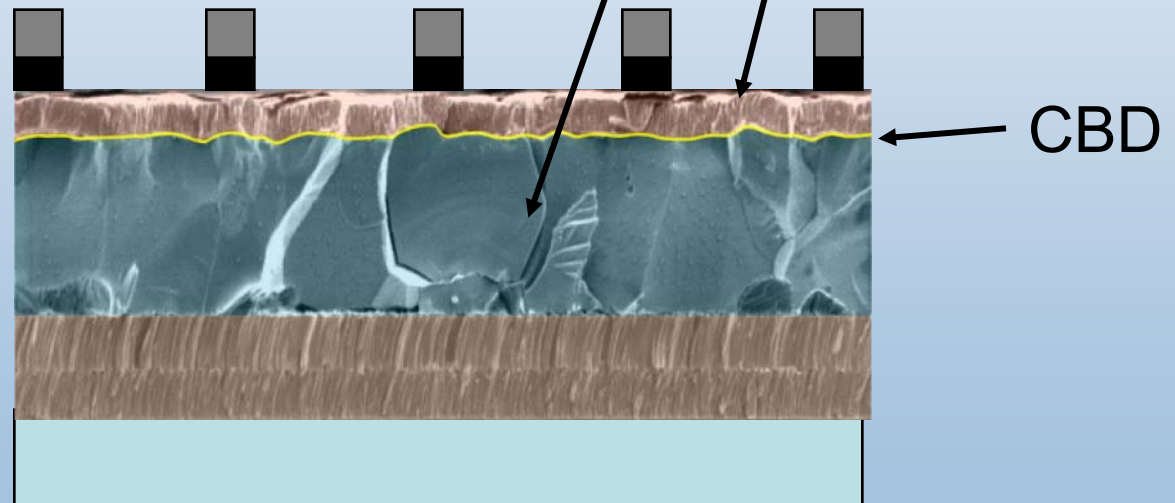
Ni/Ag contact grid

ZnO (TCO) / CdS

CIGS absorber layer

Mo back contact

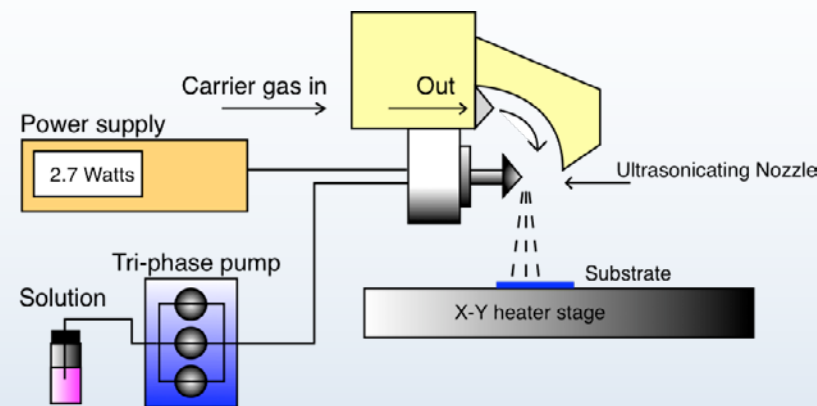
Glass substrate



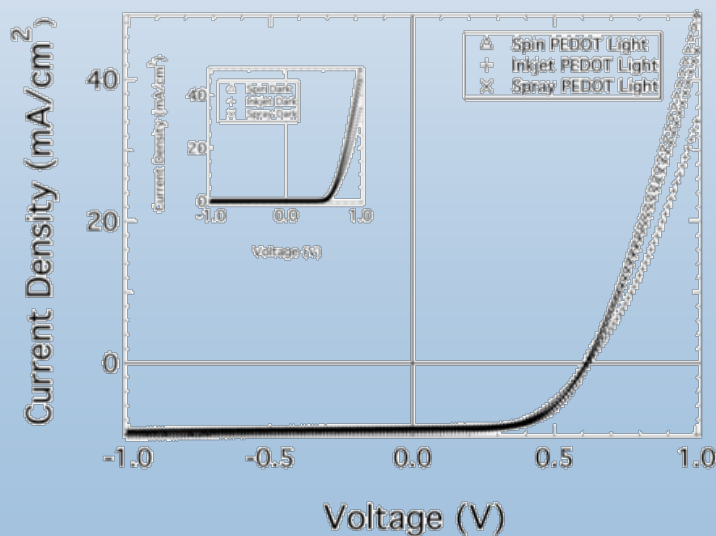
# Atmospheric processing in PV

## OPV

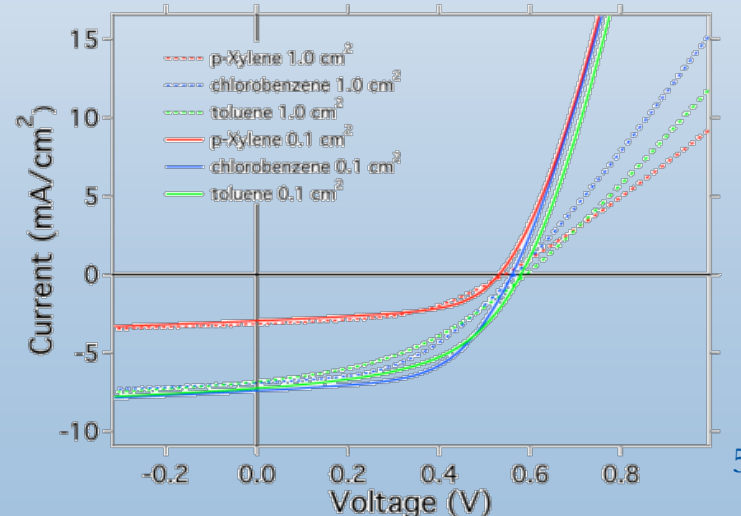
- Inkjet and ultrasonic spray produce devices comparable to spin coated for both the HIL and the absorber.
- Devices scale up in air to 1 cm<sup>2</sup> with efficiency greater than >2%
  - Setting up deposition system in glove box for increased device performance



## PEDOT:PSS Deposition



## Active Layer Deposition



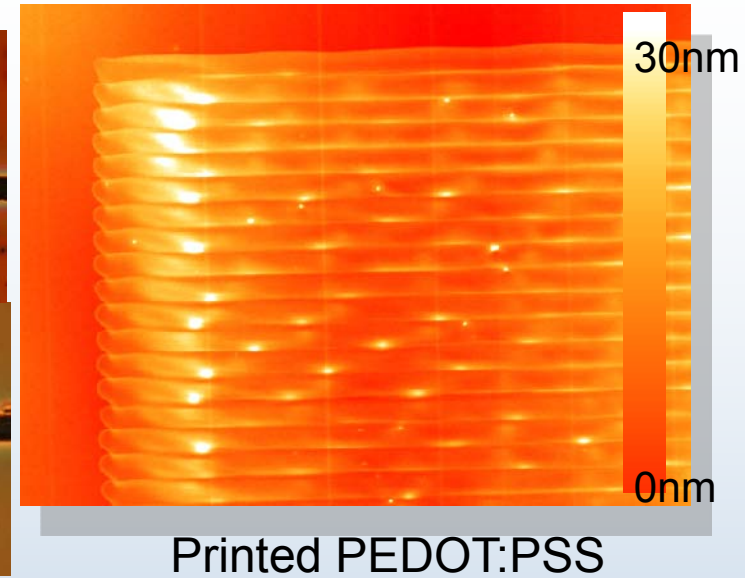
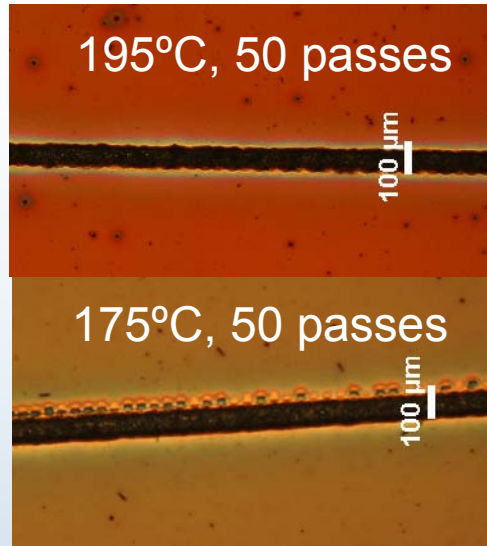
# Also....

- OPV

Sprayed or printed:

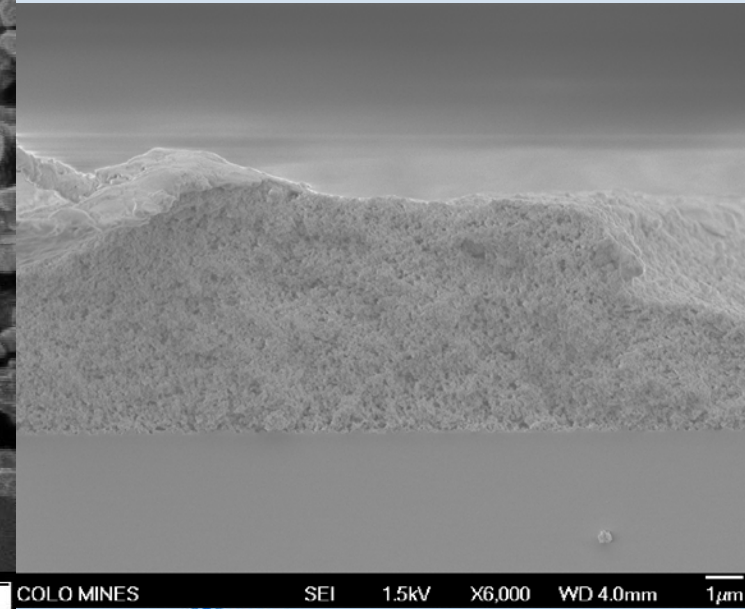
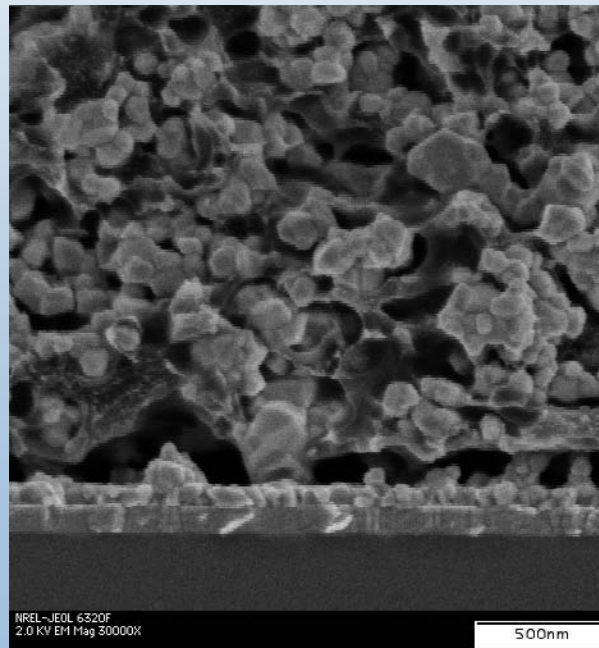
- hole blocking layer
- absorber

Printed contacts



- CdTe

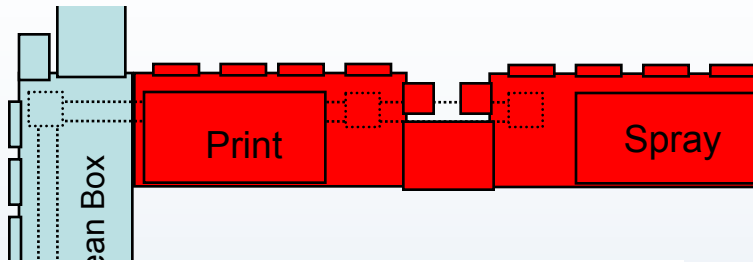
Sprayed Absorber  
CBD CdS  
Sprayed Contacts



- And more...



# Inkjet and Spray



Custom inkjet and spray system by iTi

Build into glovebox

Universal X-Y platform

Multihead inkjet system

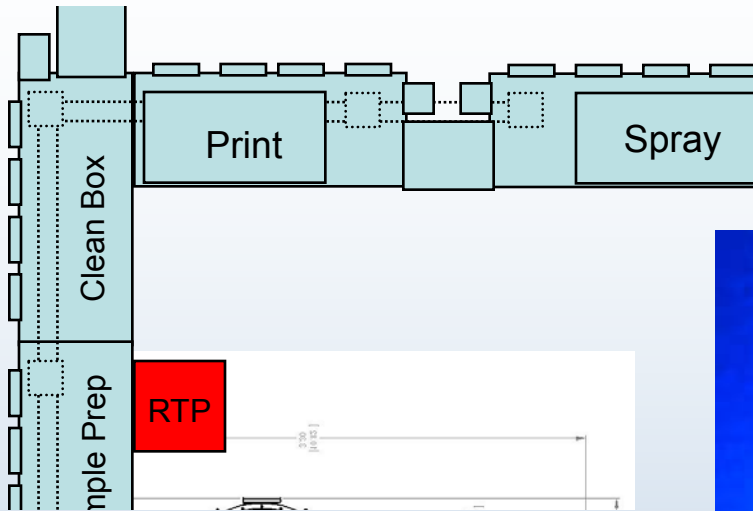
Multihead spray system

Systems interchangeable





# Rapid Thermal Processing

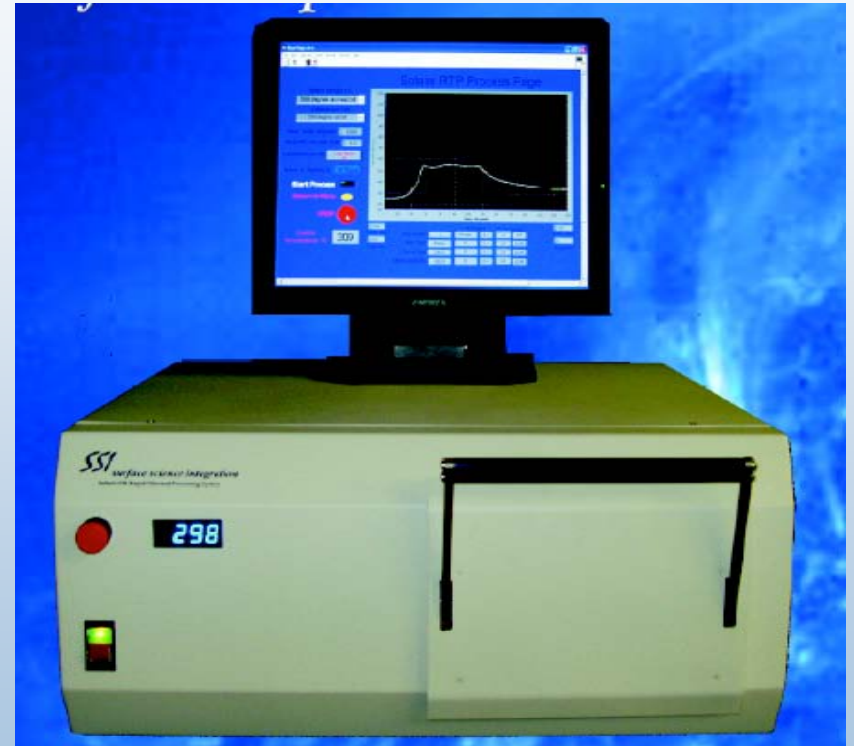


RTP by Surface Science  
Integration

Build into glovebox

Up to 1250°C @ 150°C/s

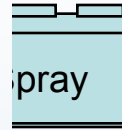
3 process gasses



# XRD and XRF

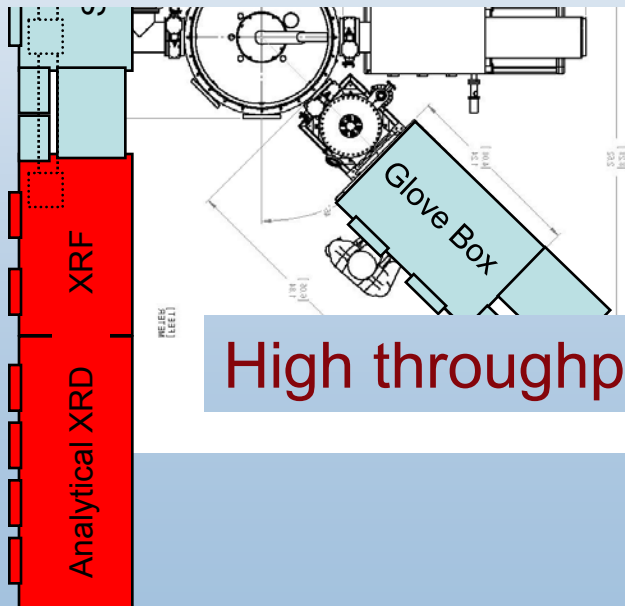
Compositional Analysis

XRF by Matrix Metrologies



Structural Analysis

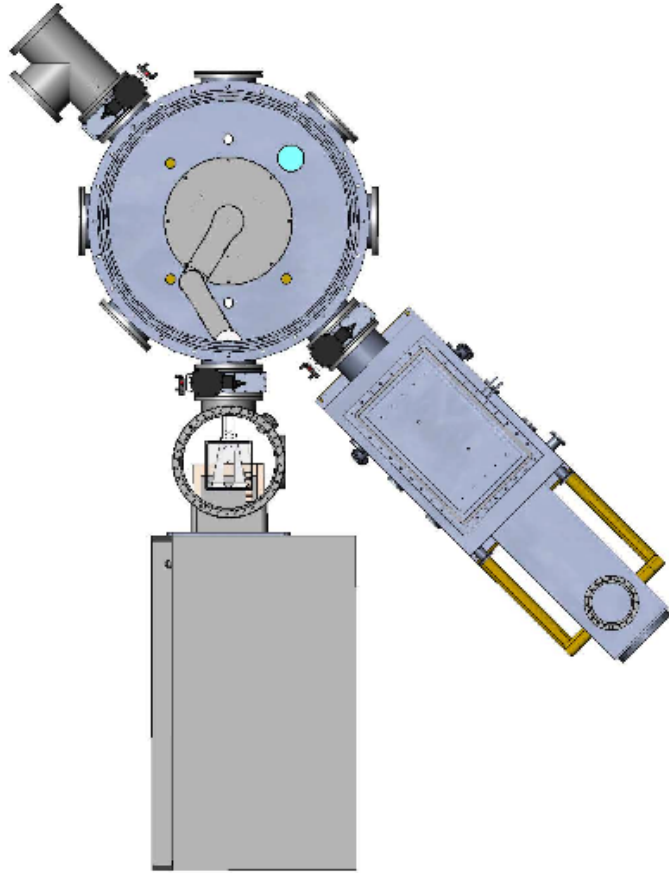
XRD by Bruker



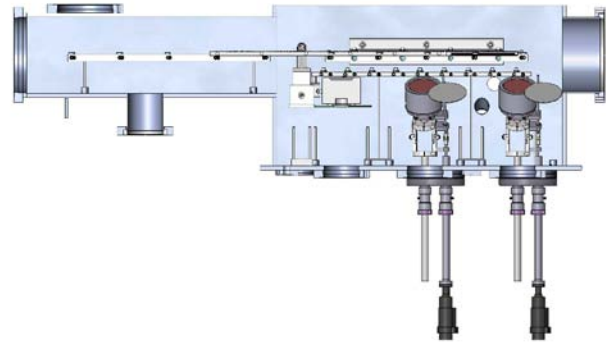
High throughput analysis



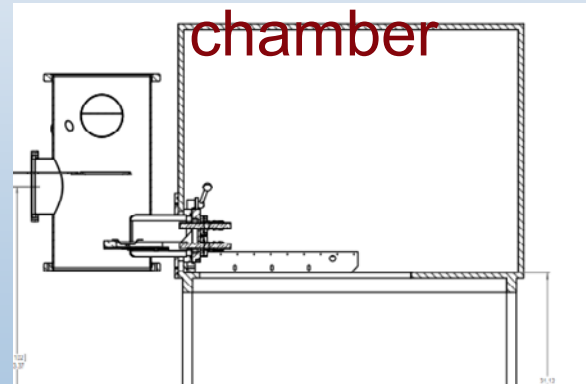
# Vacuum Cluster



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

