Standard amine-thiol solution process: Thiourea/Cysteamine

Lewis Wright

Centre for Renewable Energy Systems Technology (CREST),
Wolfson School of Mechanical, Electrical and Manufacturing Engineering,
Loughborough University, Loughborough, Leicestershire,
United Kingdom, LE11 3TU

Email: L.Wright2@lboro.ac.uk

ORCID: 0000-0002-3940-6070

DocID: 00092

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1 Back contact preparation

TBC

2 Solution preparation

In air, to an empty vial:

- Add 10ml DI water
- Add 1g cysteamine; leave to dissolve (approx. 1 min)
- Add 1g thiourea; leave to dissolve (approx. 5 mins)
- Add 0.143g Cu(II)O (1.8×10^{-3}mol)
- Add 0.098g ZnO (1.2×10^{-3}mol)
- Add 0.215g $SnSO_4$ (1.0×10^{-3}mol)
- Leave to dissolve - usable within 2-4 hours depending on mixing speed, typically left overnight
- Dilute with:
  - 30ml DI water
  - 4g thiourea

3 Deposition

Deposit onto one 50x50mm Mo substrate using an ultrasonic nozzle.
Deposition conditions:

- Flow rate - 1.5ml/min
- Stage speed - 40mm/s
- Layers - 12
- (Atomisation) power - 4.5W
- (Directional) gas pressure - 6L/min (nitrogen)
- Hotplate set point - 350°C
- Dwell between layers - 60s
- Nozzle-hotplate distance - ∼5.5cm
- Post-deposition anneal - 3mins

4 Selenisation

Processes two 25x25mm units.

- Load samples into graphite box with 12 Se pellets
- Load graphite box into tube; pump down to singe-digits (torr)
- Flush and purge with N_2 gas (2min flow)
- Selenisation conditions:
  - Starting pressure - 80Torr
  - Duration - 35mins (including ramp up)
  - Set temp - 575°C
- At end of timer open furnace lid; leave to cool naturally (approx. 35mins)
- Remove when below 50°C

5 CdS buffer layer

Bath samples as soon as possible after removing from vacuum.

- Set circulating bath to 70°C
- Add 183ml DI water to a beaker; leave to warm
- Add samples when water temp ∼55°C
- When water temp reads 60°C:
  - Add 32.6ml ammonium hydroxide (28-30 wt% solution)
  - Add 25ml $CdSO_4$ (0.015M)
  - Start 15min timer
- After 5mins add 12.5ml thiourea (1.5M)
- When timer ends remove samples and rinse with DI water
- Dry with compressed air

6 Top contact

	iZnO	AZO
Supplier	Plasmaterials	Innovnano
Purity (%)	99.9999	99.9999
Power setpoint (W)	180	180
Target diameter (inches)	3	3
Coat time (s)	900	5400
Gas flow (sccm)	1% O_2: 6 Ar: 5	Ar: 7

7 Metal grids

TBC