

## **International PV Module QA Task Force: Thin-Film Task Group Kickoff Meeting**

### *Notes from the Friday discussion sessions on Dominant Failure Modes in Thin-film PV*

#### **Breakout Session: What failure modes should we be most concerned with for thin-film products?**

*Session leaders were John Wohlgemuth, NREL; Alan Ward, First Solar; and Daniel Cunningham, BP*

#### *Include in TF:*

“Corrosion”: Corrosion/chemical attack scribes (meaning moisture ingress and moisture facilitated corrosion - not everything is corrosion; also ion mediated corrosion as in PID)

“Structural component”: Structural component degradation (Peeling [delamination of thin film layers within module; TCO, Mb delamination observed]; delamination of macroscopic components – structural components; cohesive failure - includes encapsulation weathering, edge seal weathering)

“Interconnect/circuit”: Interconnect failure/circuit failure (contact corrosion/ loss of contact pressure/ solder fatigue)

“Semiconductor device”: Diode quality degradation (semiconductor by diffusion)

“Electrode film degradation”: Contact layer degradation (TCO, metal layer; series resistance; moisture oxidation... diffusion, or electron transport)

“Shunt resistance”: Shunt degradation (includes scribe lines); shunt resistance

#### *Exclude TF:*

Mounting, frame – design issue

Hail – design issue

Back foil (backsheet)- common to Si QA TG’s

Backrail attachment – not ubiquitously used, likely covered under delamination (macroscopic)

Diode - common to Si QA TG’s

Arcing - common to Si QA TG’s

TF specific corrosion – this is already covered under corrosion (moisture mediated or contact layer degradation)

Isolation scribes – manufacturing issue, covered in TG1

Soiling – may couple to cause hot spots; similar to Si

Alignment – design & installation issue

Glass breakage – residual stress in glass, CTE misfit, glass corrosion

Rodent chewing, etc - common to Si

Walking on modules – not wear out

Box cutter – not wear out

Discoloration – this does not affect performance

Puddles of water – installation issue