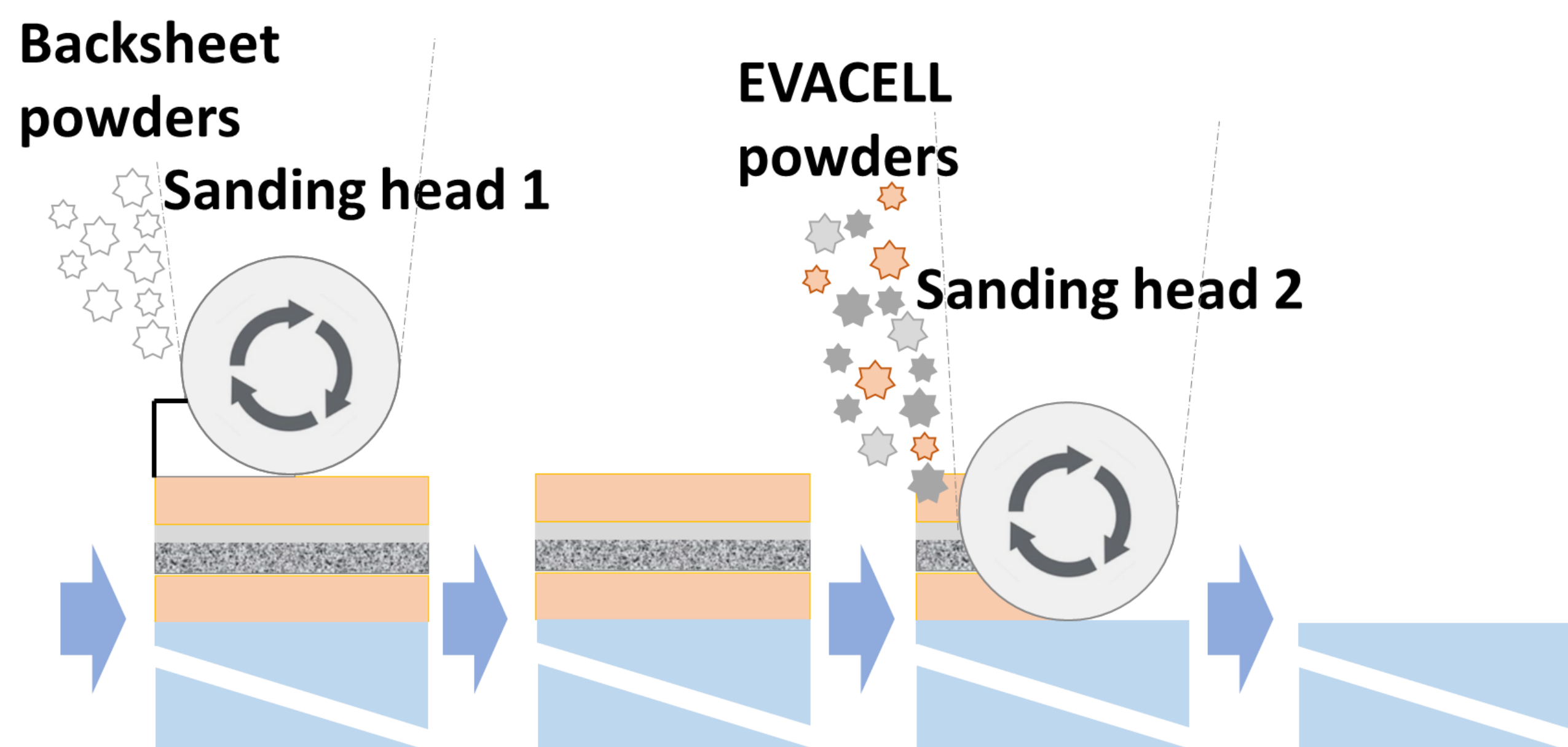


Closing the loop of module recycling: integration of recovered glass and backsheet into new modules

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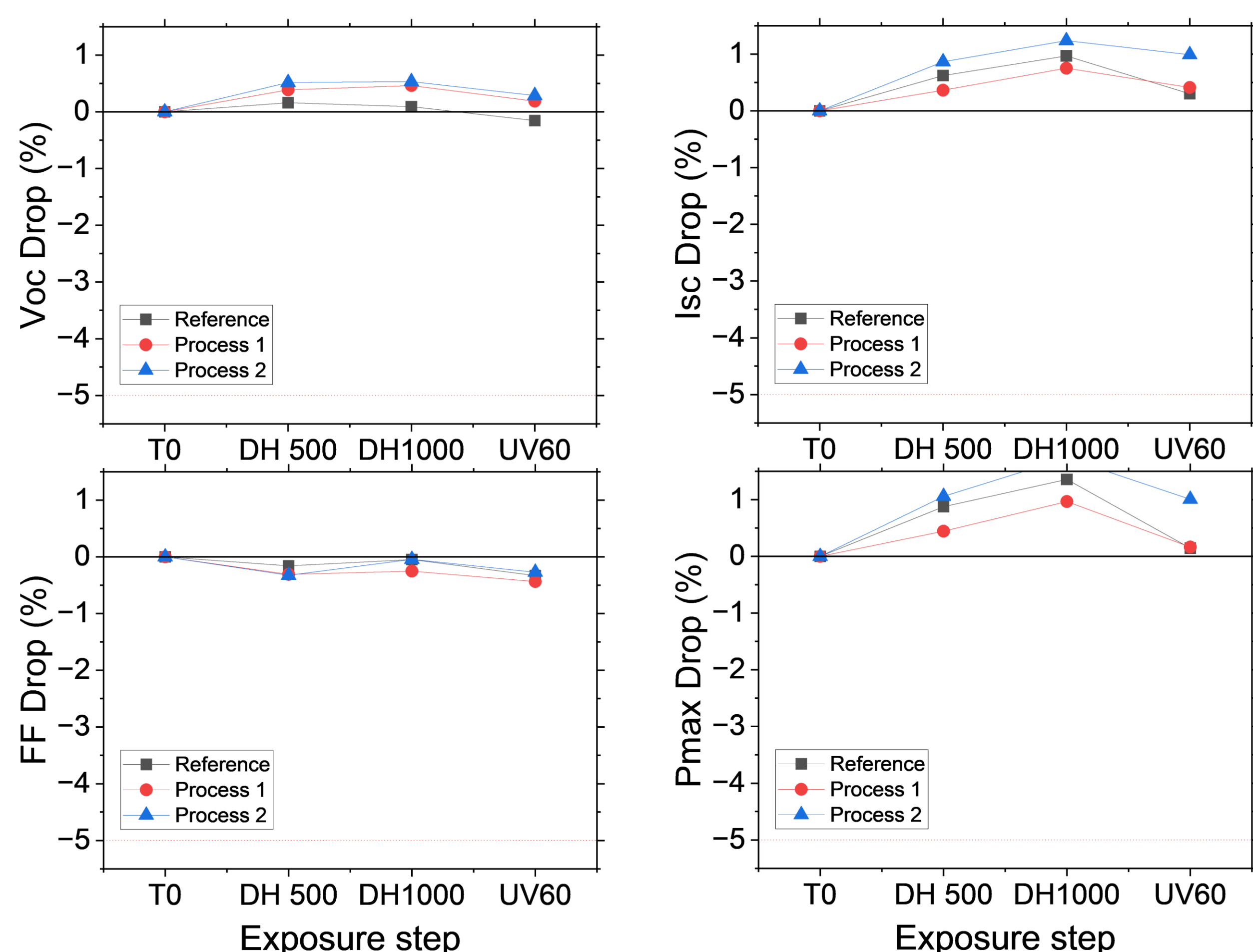
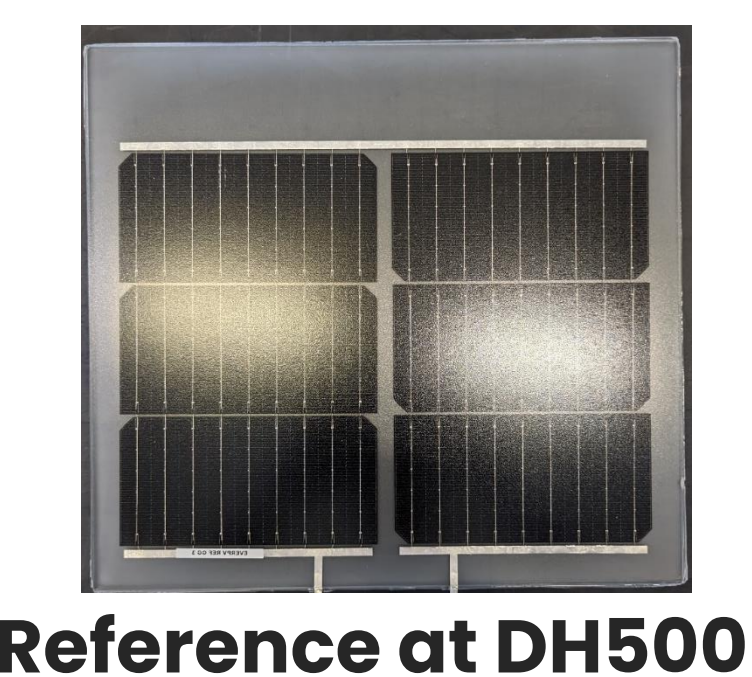
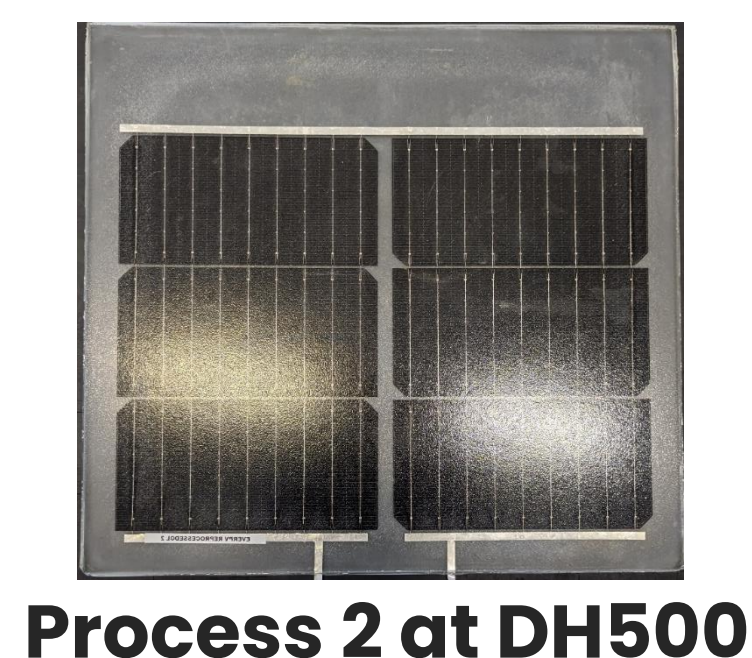
Glass recovery



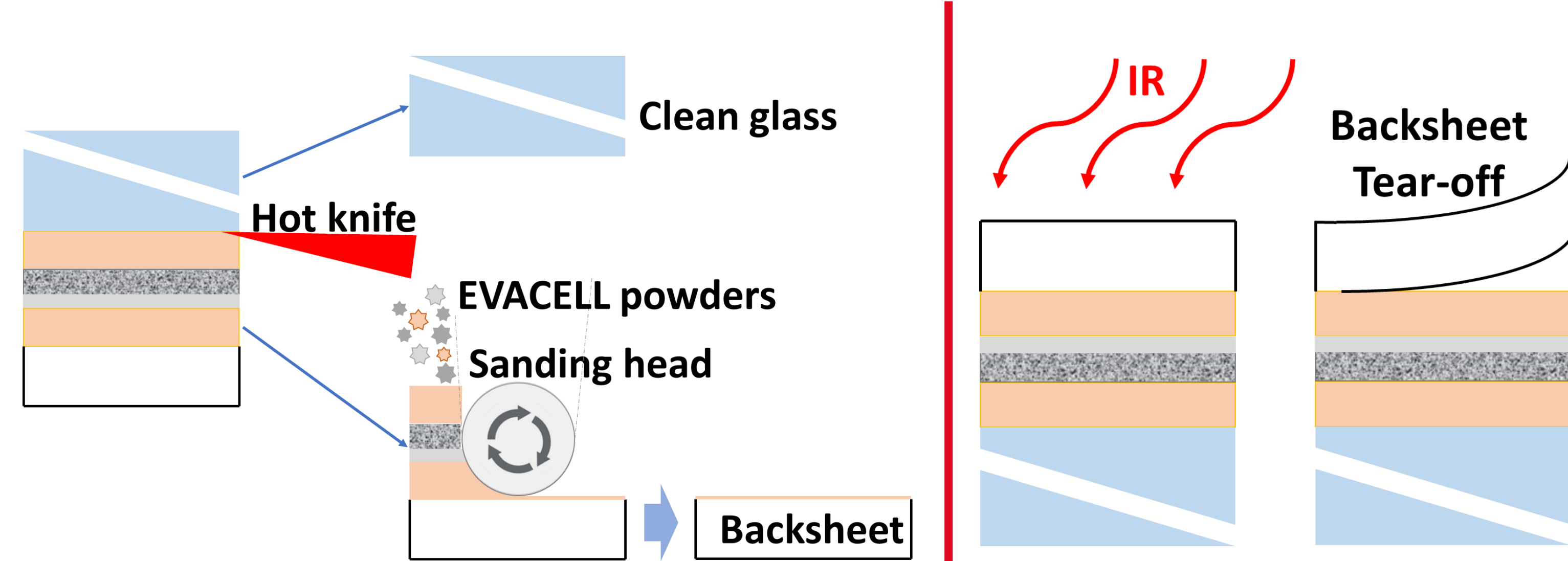
- Recovered clean glass reused directly or as cullet in float
- 500 tons of cullet into float (~6 wt% load)

Glass reuse/recycling

- 10 modules with sanded glass (2 processing methods)
- 5 modules with recycled float glass (to be made)
- 5 virgin reference modules
- "Cloudy" glass with ~6% lower direct transmittance
- Combined stress of 1000 h DH followed by 60 kWh UV
- Whitening of encapsulant border (I_{sc})

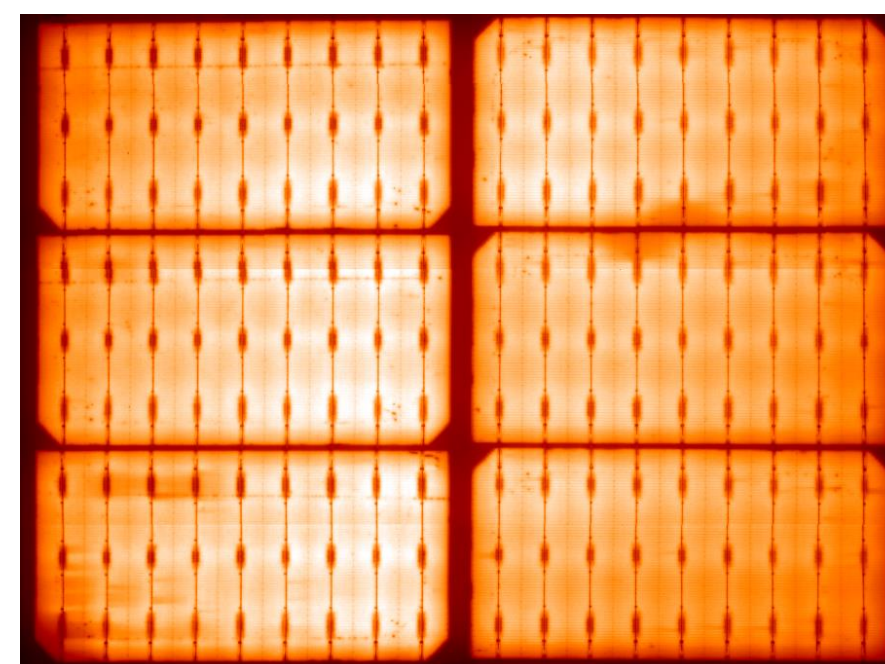


Backsheet recovery

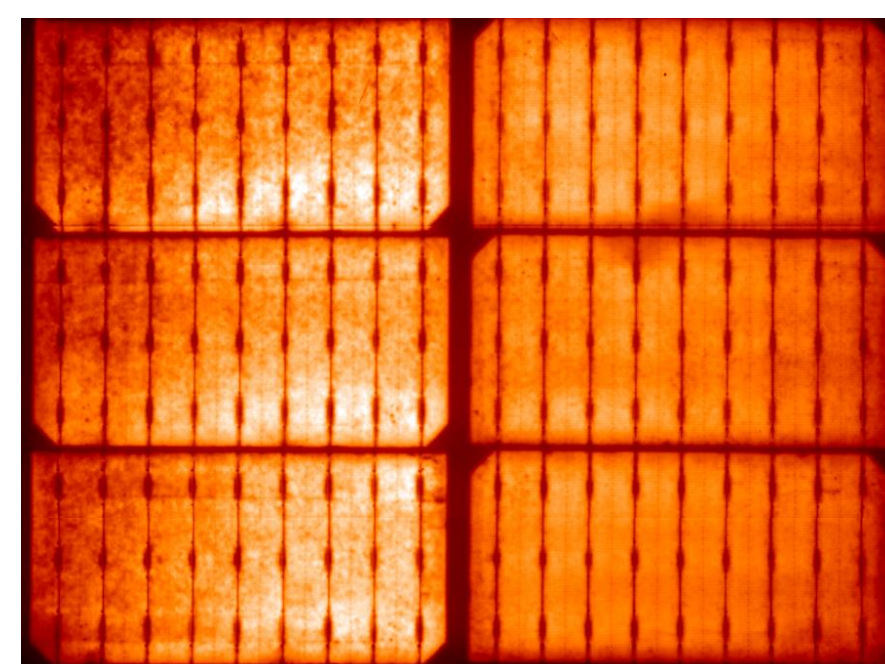


Backsheet reuse

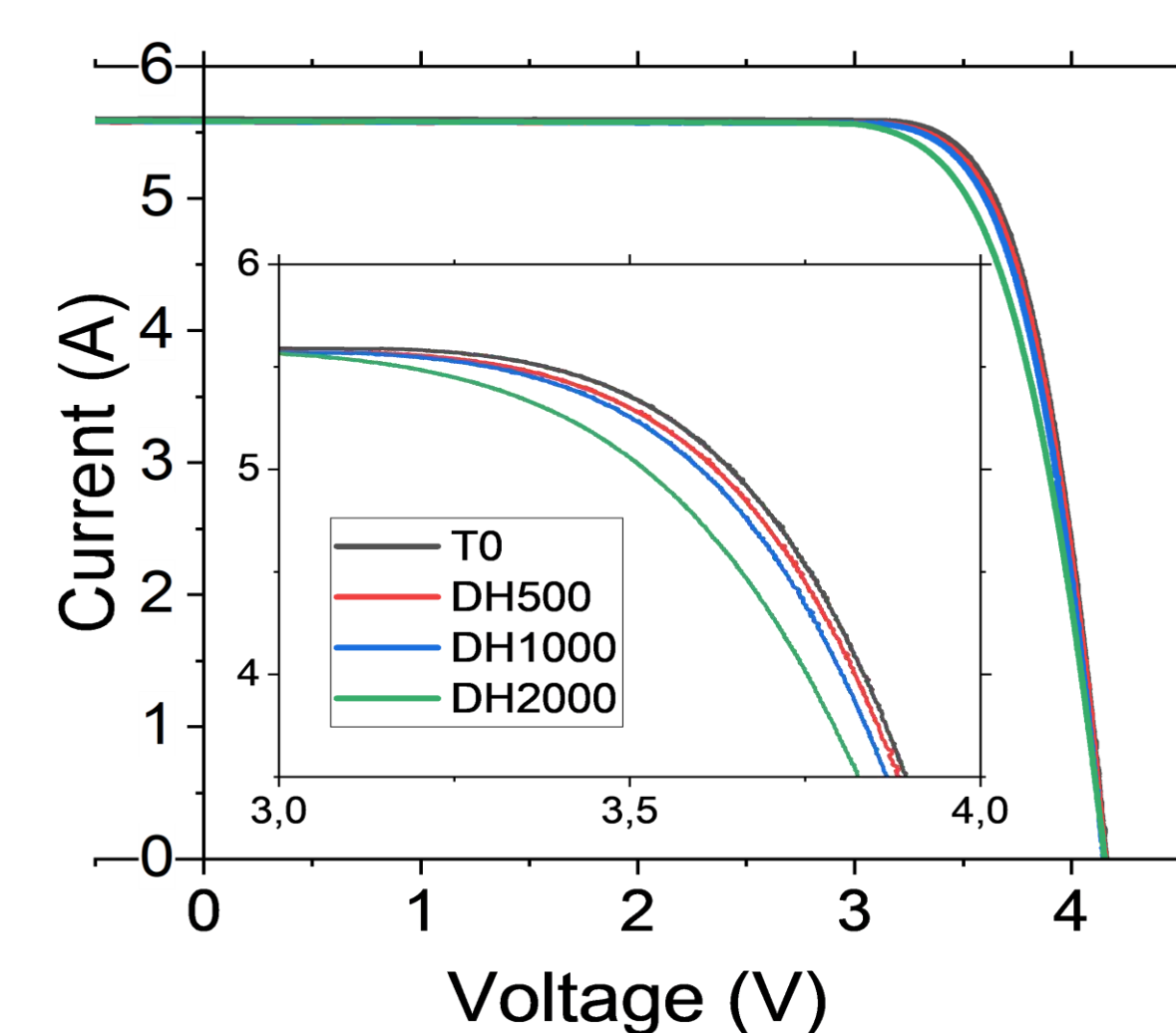
- 5 modules with sanded BS
- 5 modules with torn-off BS
- 5 reference modules (virgin commercial BS)
- Initial performance undistinguishable from reference
- 2 of each series sent to 60 kWh UV, evolution lower than 0.3% P_{max}
- 2 others sent to 2000 h DH
- Less than 5% loss for 2000 h DH (exposure ongoing for torn BS)



Typical EL at T0



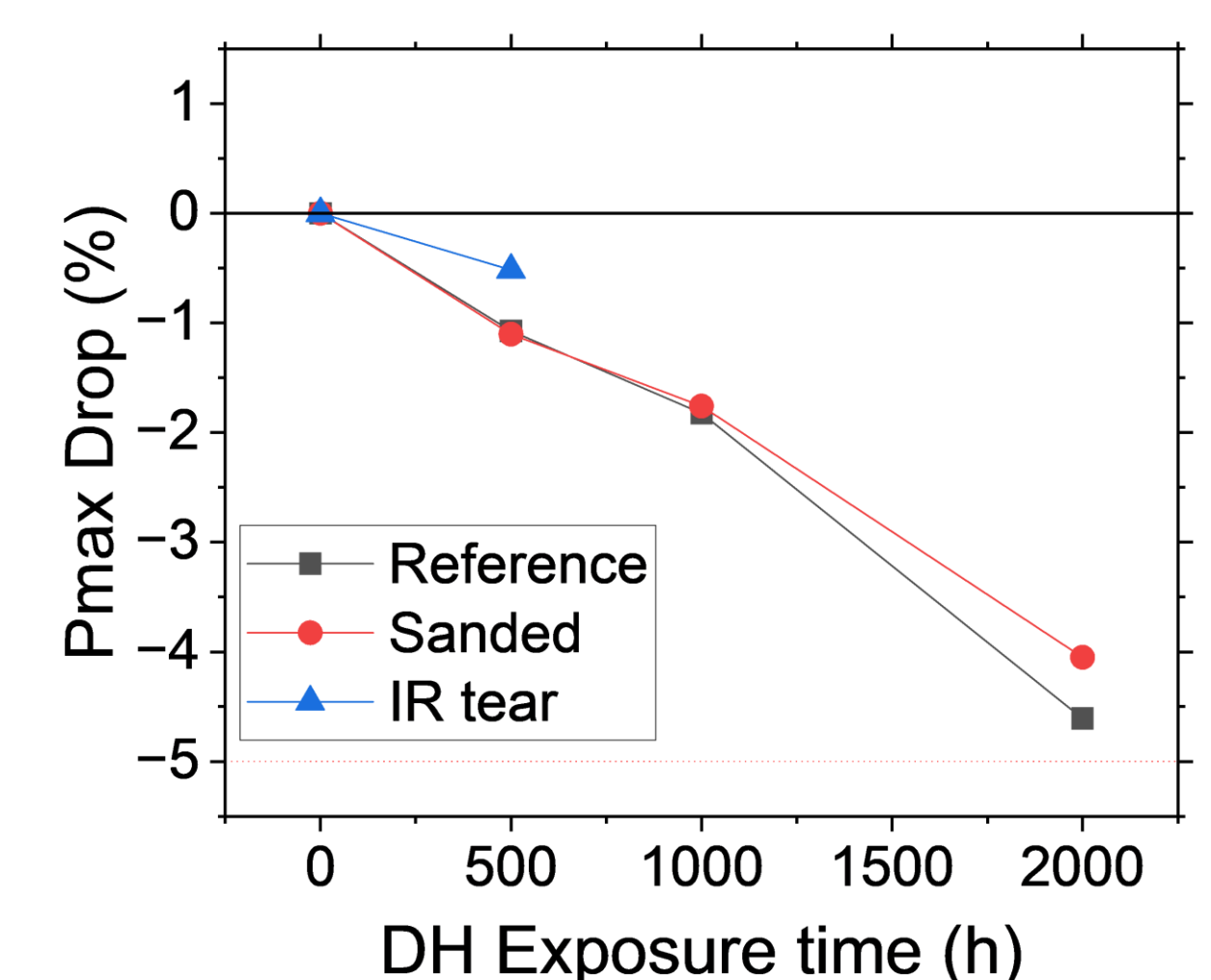
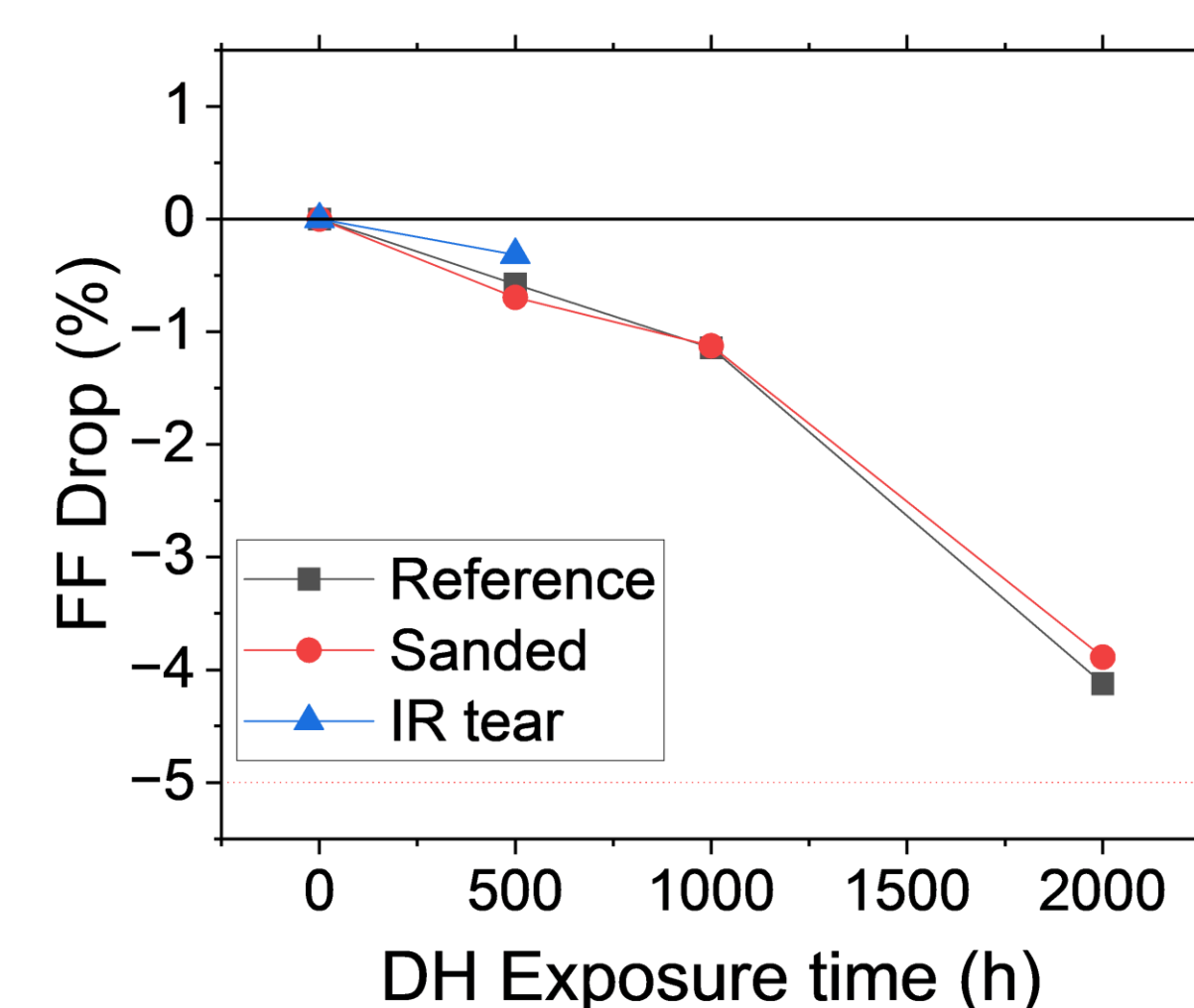
Typical EL at DH 2000 h



Sanded BS module frontside



Sanded BS module backside



Conclusion-Takeaway

- Mini-modules were fabricated with direct reuse of materials after delamination
- Modules show good initial results, close to references. Lower for sanded glass (-1.2% P_{max})
- Impressive stability upon DH and UV exposure
- More modules to come, including float glass with recycled content
- Demonstration on full-scale module undergoing