Which Polymer for Reliable Silicon Thin-Film PV Module?

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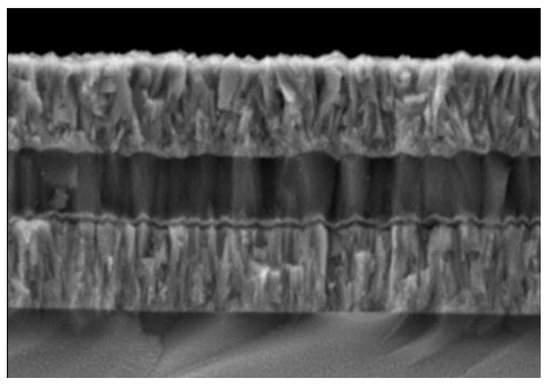
Requirements for Silicon Thin-Film PV Module

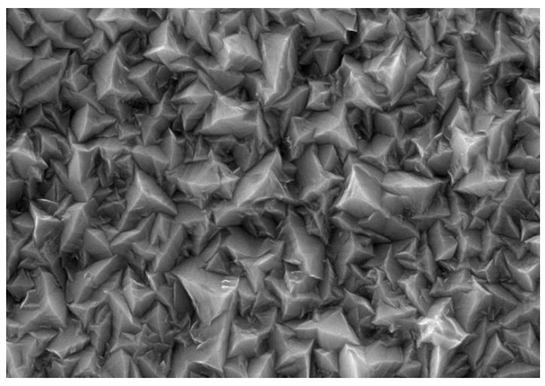
Stable
- UV
- temperatures
- chemical degradation

Compatible
- corrosion, chemical reactions
- diffusion, dissolution
- adhesion

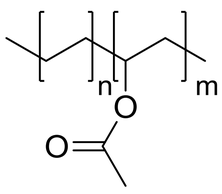
Barrier
- water vapor
- O_2 and other pollutants

Transparent Conductive Oxides (TCO)

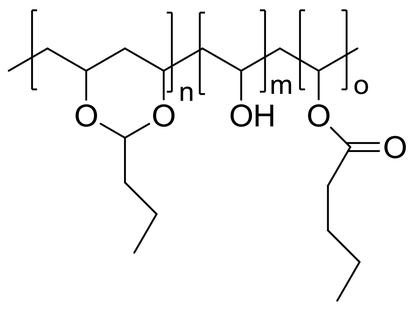




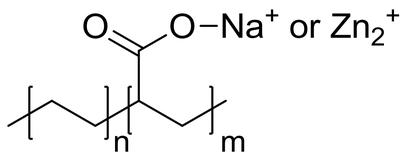
Polymers tested



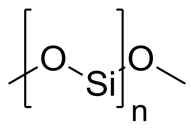
Ethylene Vinyl Acetate (EVA)



Polyvinyl Butyral (PVB)



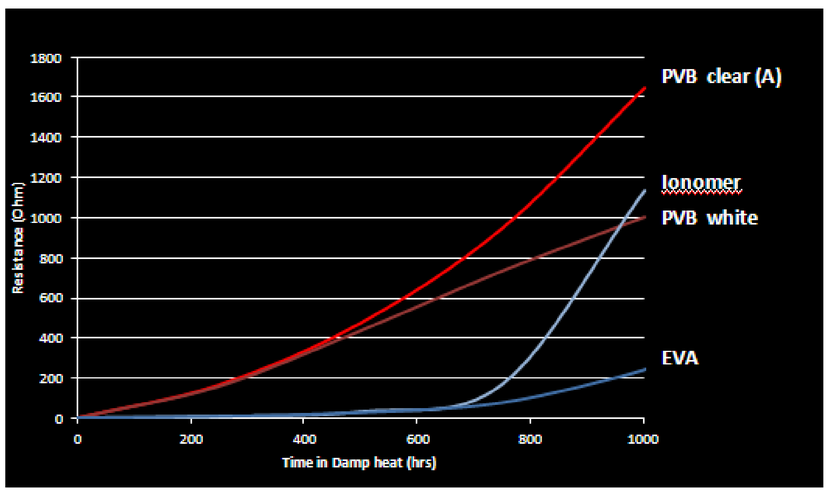
Ionomer



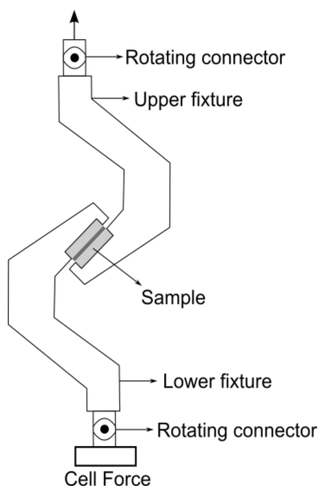
Silicone liquid and foil

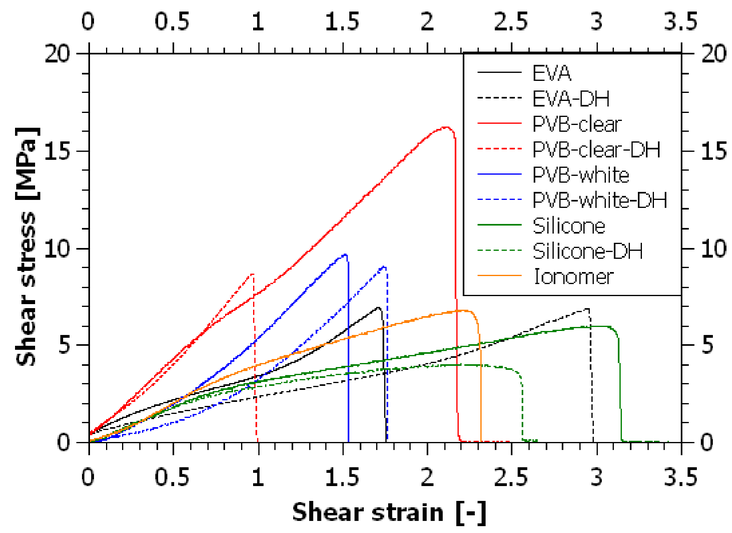
Results

TCO degradation in damp heat conditions



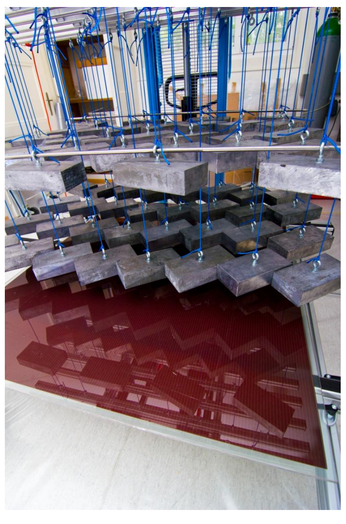
Compressive Shear Test (CST)

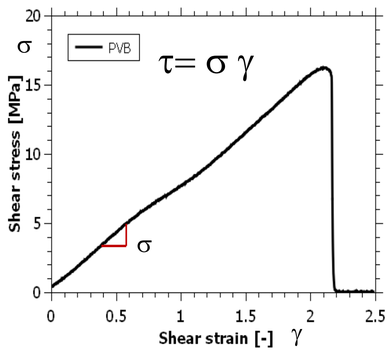


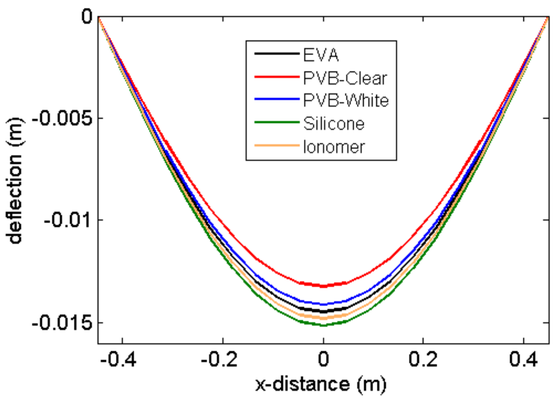


CST results, showing she shear stress as a function of the shear strain for each polymer samples (Valentin Chapuis et al. submitted to PIP)

Mechanical load test







Simulation of the deflection based on the CST measurements

- EVA shows a positive evolution of adhesion after degradation,
- PVB has the highest initial adhesion,
- Silicone module shows a poor adhesion, unsuitable for passing mechanical tests but a considerable energy absorption leading to the highest deflection,
- Ionomer shows a good compatibility with TCO layers.

Conclusion

Photovoltaic modules are:
- installed in very different environments ,
- used for various applications.

→ **This should influence the choice of the encapsulation materials**

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