Prolonged Lifetime Performance of Meyer Burger’s Hetero Junction Solar Modules

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Introduction

- PV module guarantee of 30+ years is required
- Encapsulants function as adhesion of module components and provide protection from environmental impact
- EVA currently covers over 90% of the market
- First long term outdoor experience uncovers excessive failure of EVAs
- Other encapsulants clearly show improved performance over EVA
- Especially TPOs provide extended module reliability demonstrated in DH and TC tests
- TPO allows for short lamination time < 8 min (GG, one chamber)

Material Performance

- Water Absorption Properties

<table>
<thead>
<tr>
<th>Encapsulant</th>
<th>Water absorption (%)</th>
<th>WVTR (g/m²/day)</th>
<th>Probability of moisture ingress related degradation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVA</td>
<td>0.2-0.3</td>
<td>10-30</td>
<td>+</td>
</tr>
<tr>
<td>PVB</td>
<td>0.4-0.5</td>
<td>25</td>
<td>+</td>
</tr>
<tr>
<td>TPO</td>
<td>&lt;0.1</td>
<td>&lt;5</td>
<td>-</td>
</tr>
<tr>
<td>Silicone</td>
<td>&lt;0.1</td>
<td>&gt;35</td>
<td>-</td>
</tr>
<tr>
<td>Ionomer</td>
<td>&lt;0.1</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

- PID (potential induced degradation) stability of TPO
- No yellowing of TPO

Reliability

EL after 7000 hours Damp Heat Test (85% RH, 85°C)

- Moisture ingress leads to cell degradation
- HJT solar cells are even more sensitive to moisture compared to std. cells
- TPO is intrinsically better regarding cell degradation

Outdoor: Monterosa @ 9460 ft

Test field: HJT-SWCT-GG  @ 311 W => 4.665 kW
p-c-Si mono-3BB-GG  @ 252 W => 3.78 kW

TPO encapsulant; 5 mm glass at the front and at the back; mounted with pads at the back glass.

Outdoor conditions: -20°C to +40°C

Conclusion

TPO encapsulants show improved module reliability over EVA:
- High water vapor resistivity
- No degradation; No delamination
- No PID
- No yellowing

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