Snail Trails and Discolorations

Snail trails are understood as linear discolorations on parts of the solar cell surface. There are two types of snail trails (see Fig.1):
Type I) non-uniform discoloration all over the cell and
Type II) uniform discoloration only on the cell edge.

Type I discolorations are resultant of micro cracks (see Figure 4). The fractures are characterized by a "double trail" along both sides of the propagated crack in the cell. Potential performance losses that arise in connection with type I defects are directly related to the deactivation of cell components by such fractures and not to the discolorations. Q.CELLS employs a 100% outgoing electroluminescence inspection test on all of its modules to ensure that they are free of such cell breakage which could cause loss in power.
Micro cracks, which can arise due to naturally-occurring stresses (i.e. wind or snow load etc.), are a common phenomenon and considered state of the art. A resulting power loss due to this effect is included in the linear performance guarantee of Q.CELLS.

Type II discolorations in all previous cases have been exclusively optical modifications and do not result in performance loss. These kinds of edge discoloration, to our knowledge, have no effect on the safety or long term stability of the solar modules. We have determined the cause to be a chemical reaction between the silver of the cell contact fingers and a component of the module backsheet. The discoloration occurs in the uppermost nanometers of the cell fingers (see Figure 2) and has no influence on the electrical characteristics of the cell. Q.CELLS has conducted extended reliability tests with these cells for a time period being twice as long as required by stringent module certification standards – we have not observed any performance degradation (see Figure 3).

Please note: As long as snail trails are simply stains on the surface of the cell, they are not subject of the Q.CELLS product and service guarantee, as neither the mechanical stability nor the module power is affected.

If you still have questions or suggestions, our Customer Competence Center would be pleased to help.

EMAIL service@q-cells.com **TEL** 03494 6699 23222

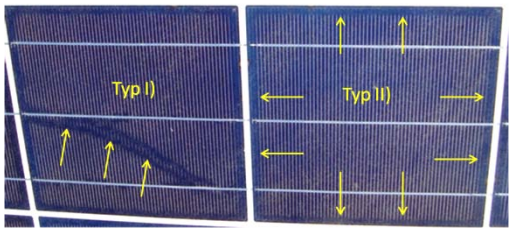

Figure 1: Two types of discoloration described herein.

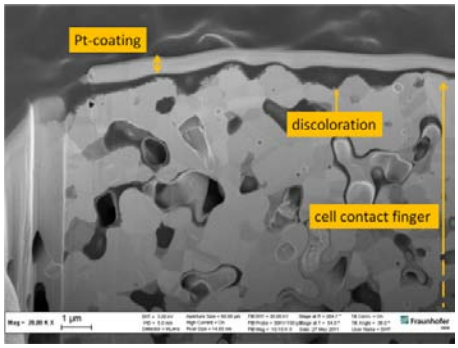

Figure 2: Scanning electron micrograph of cross section of discolored contact finger surface (Source: Fraunhofer CSP Halle)

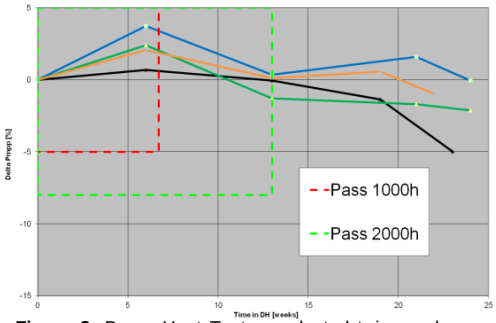

Figure 3: Damp Heat Tests conducted twice as long as that required by the photovoltaic norm IEC 61215 (standard is 1000 hours)

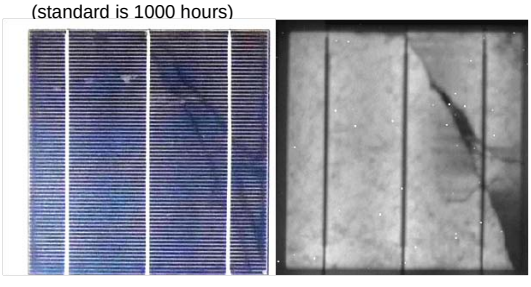

Figure 4: Left is optical photo of cell, right electroluminescence photo of same cell.