

The challenges of testing the UV-impact on PV-modules

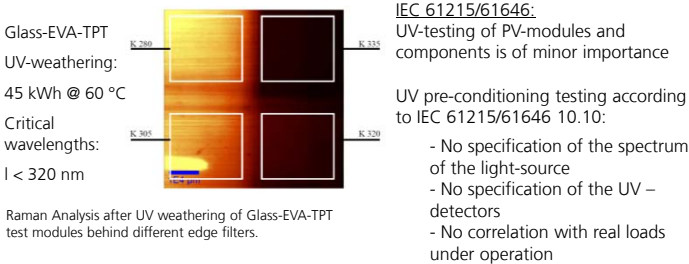
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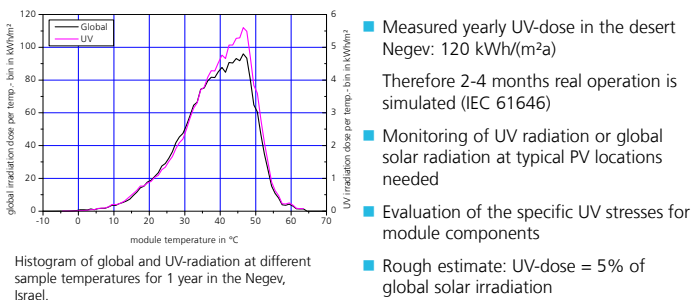
Abstract

Accelerated testing of the durability of materials exposed to natural weathering requires testing of the UV-stability, especially for polymeric materials. The type approval testing of PV-modules according to the standards IEC 61215 and IEC 61646 includes a so-called UV-preconditioning test with a total UV-dose of 15 kWh/m². Measurements of the natural UV-stress indicate a yearly total UV-dose of more than 100 kWh/m². Accelerated life testing requires higher UV-power than provided by natural sun-light and additional acceleration by enhanced temperatures and the neglecting of dark periods. The combination with humidity as a potential reaction partner for degradation processes becomes an even bigger challenge under such circumstances. Results from PV-module testing will be presented and a work plan for evaluation of accelerated life testing procedures will be outlined.

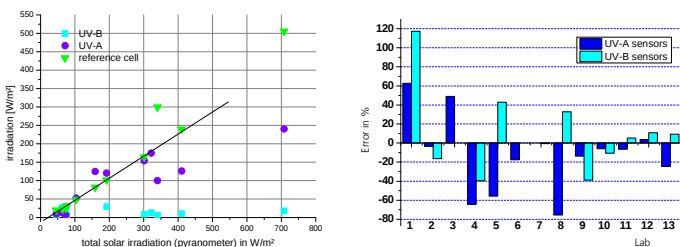
Challenge 1: Spectral Sensitivity of Materials



Challenge 2: UV Stress in Operation



Challenge 3: Integral UV-Sensors



Summary

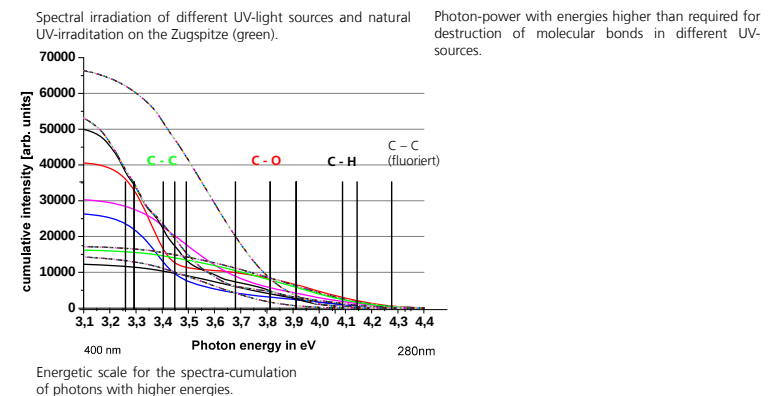
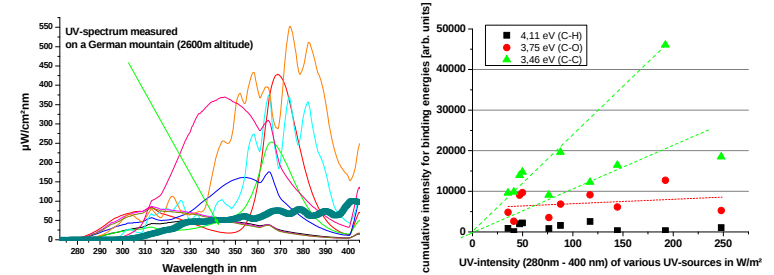
- The total UV-dose in a desert was found to be about 120 kWh/(m² a), roughly about 5,5% of the total solar irradiation. A service life of 25 a sums up to 3000 kWh/m².
- Accelerated life tests are needed.
- Artificial UV-sources differ strongly from the solar UV-spectrum, therefore different ageing behavior of samples with a wavelength-dependent spectral sensitivity in UV-tests with different lamps have to be expected.
- Integral UV-sensors for artificial UV-sources can be used for rough estimates, especially when they are calibrated with the same kind of radiation source.
- In-expensive spectro-radiometers can be suitable for the measurement of the UV-radiation when they are well calibrated.

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Challenge 4: Different UV-Sources



Challenge 5: UV, Temperature and Humidity

