Flexible dye-sensitized solar modules

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Sufficiently high efficiency and low production costs are important characteristics to make dye-sensitised solar cells (DSC) modules competitive with other alternatives on the solar energy market.
A continuous production process has generally a high potential for low cost production. Our development of a method for manufacturing the nanostructured porous layers at room temperature will be discussed. The porous layers are pressed on a conducting glass or plastic substrate [1]. Compression of a particle layer leads to formation of a mechanically stable, electrically conducting, and porous nanostructured film. Overall solar to electric conversion efficiencies of up to 6.1% at 0.1 sun using plastic substrates have been obtained.
A major goal for our activities in the Angstrom Solar Center is to demonstrate the feasibility of manufacturing DSC modules in a continuous process. We have now demonstrated in lab-scale a solution to all steps necessary for the production - (calendering, scribing, wire deposition, electrolyte filling, lamination). Some of the key steps will be discussed at the meeting. One of these steps concern the introduction of interconnects allowing individual cell segments to be internally connected in series or parallel forming a DSC module. During the last years we have developed an interconnect technology aiming at fulfilling special requirements of the technology such as chemical protection of the wires from the electrolyte, compatibility with a continuous manufacturing process and cost efficiency.
Light-to-electric conversion efficiencies obtained with interconnected plastic modules at indoor light intensities are comparables to amorhphous silicon. Stability tests will be presented at the meeting. So far we have reached stability for a plastic cell exceeding 4000 h under continuous indoor illumination. Dynamic bending tests show promising properties for the plastic modules from a flexibility point of view.

1. H. Lindström, A. Holmberg, E. Magnusson, S. –E. Lindquist, L. Malmqvist, and A. Hagfeldt, *Nanolett.*, 1, (2001), 97-100.