Life Cycle Assessment of industrial-scale dye sensitized solar module manufacturing process: a consequential approach for mass production potential evaluation

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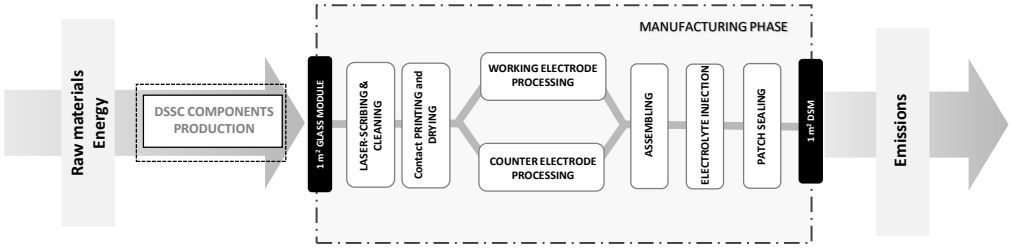
Starting from the first work about the production process of a dye-sensitized solar module (DSM) in 1996 [1], research and development looking for the fine tuning of DSMs characterized by acceptable efficiency, stability and durability led to notable technological progress.
The activity in this field have seen research groups and companies combined in the challenge of realizing DSMs to be launched on the market and to be competitive with other thin film technologies [2]. In this context, important results have been obtained on DSMs for indoor energy harvesting applications, that nowadays represents a consolidated photovoltaic market niche for this technology [3]. On the other hand, the use of DSMs for outdoor and BIPV applications has been assessed to be a viable and environmentally sustainable opportunity [4] but more work has to be done to evaluate the advantages of DSMs over other thin film technologies already present on the market [5].
In this work we present the outcomes of the life cycle assessment of DSM manufacturing process on industrial scale simulating a mass production layout. The analysis is focused on the calculation of the environmental footprint of the DSM in order to highlight the hotspots of the production system and to compare the performances of the dye-sensitized solar cell technology with the actual major competitor for BIPV, i.e. amorphous silicon. The consequential approach adopted for the analysis will allow to draw several scenarios to understand the critical issues and opportunities and for assessing the market potential of DSM.



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