Organic Photovoltaics for Building Integration: Benefits and Barriers

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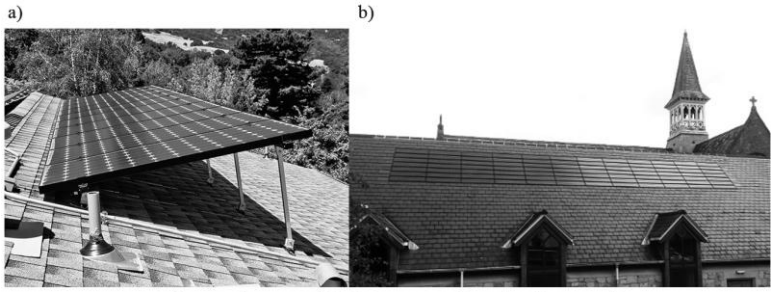
Photovoltaic (PV) technology is growing constantly and evolves to new sectors due to its versatility and continuous development. In building and industry sectors PV systems are very interesting because the generation of electricity on site presents some advantages such as a reduction of transportation and distribution losses, improvements in quality and continuity in peak-hours and reduction of environmental impacts. Moreover, PV cells can replace conventional building materials by integrating them into building envelope and create a dual function: building material and power generation, this concept is usually known as Building Integrated Photovoltaics (BIPV) [1] and can offer more advantages than usual rack-mounted PV systems: BIPV modules can be naturally integrated into the design of the building (aesthetical aspect), have influence on the heat transfer through building envelope due to the change in thermal resistance, reducing heating or cooling loads, lightweight, reduced labor requirements and amount of sub-components associated with rack or frame system, besides semi-transparent PV modules can provide natural lighting.



a) Open rack-mounted PV (Source: g-solar.eu/roof-systems/)
b) Direct-mounted BIPV (Source: solarcentury.com/uk/case-studies)

PV products based on c-Si technology are the most widespread and predominant on the market due to high power conversion efficiency. However, in BIPV geometrical and dimensional flexibility are important properties because PV module needs to blend into the building structure. In this regards, Organic Photovoltaics (OPV) presents great advantages for BIPV. Reasonable manufacturing costs made possible by roll-to-roll production techniques will play an important role on the PV market [2] and although there are some barriers which need to overcome to consolidate this technology (efficiency and lifetime) the prospects look very exciting: mass-producible with customized sizes or characteristics and competitive prices, new materials (graphene and new polymers), increased absorption of light (long/short-wavelength) or improves in encapsulation.

References

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