New organic dyes for high-transparency DSSC: complementarity and synergies

Daniele FRANCHI - *CNR-ICCOM*

The intrinsic properties of DSSC have proven that the application of this technology will most likely be confined to some niche fields of application like the exploitation of indoor residual light for powering small remote devices like sensors for IoT, or the generation of photovoltaic devices with high perceived transparency to the human eye to be integrated in windows.

Our group has a longstanding experience in the design and synthesis of organic dyes, here we report on a class of thienopyrazine dyes for DSSC that, simply by changing the structural design allows access to dyes with opposite properties to fit both the applications noted above. In the case of thienopyrazine dyes with a symmetrical design, the composition of the light transmitted through the transparent DSSC fits well with the human eye sensitivity spectrum thus fulfilling the transparency requirements for building-integrated photovoltaics (BIPV).

Despite such high average visible transmittance (AVT) the developed dyes show decent power conversion efficiency (PCE) that was further enhanced by co-sensitizing the devices with other dyes transparent on the visible region and developing transparent redox couple and electrolyte mixture to maximize the light utilization efficiency (LUE) of the whole device.