

EGU21-5879, updated on 01 Dec 2021

<https://doi.org/10.5194/egusphere-egu21-5879>

EGU General Assembly 2021

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Organic photovoltaics as a solution to overcome growing atmospheric carbon emissions

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Nowadays, climate change is a reality because energy demand is mostly satisfied by fossil fuels which are limited resources and also responsible for greenhouse gas emissions. Actions have to be undertaken to overcome this issue. Among the solutions proposed to this is the development and use of new energy sources called renewable energies. By renewable energy, we understand energies coming from the sun, wind, geothermal, water, or biomass. Of these, solar energy is one of the most abundant, clean, effective, and easily deployed. One of the efficient ways to exploit solar energy is photovoltaics.

Two decades of research have allowed organic photovoltaics to appear today as an alternative to their conventional and inorganic counterparts. However, several issues have to be addressed in order to ease their production on an industrial level. Bulk heterojunction (BHJ) solar cells based on the blend of two types of conjugated molecules acting as an electron donor (hole transport) and an electron acceptor (electron transport) are the most efficient organic solar cells. Further, using non-fullerene acceptors (or NFA) in these BHJ solar cells have recently gained a broad interest due to their great potential to realize high conversion efficiencies (more than 18%) with a long lifetime over the conventional polymer/fullerene blend solar cells.

Here we provide an overview of the recent progress of different existing and growing photovoltaic technologies. We also provide prospects for the future development of organic photovoltaic devices.