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Low bandgap Metallooligomers for Organic Solar Cells

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Nowadays renewable energy technologies attracted a lot of attention due to the limitation of fossil fuel. One of the best renewable energy harvesting devices is organic solar cells (OSCs) as bulk heterojunction. The active layer is composed of a blend of donor usually a low bandgap conjugated polymer and acceptor like fullerene ($PC_{61}PM$) or non-fullerene (Y6). Tremendous efforts have been devoted to increase the power conversion efficiencies (PCE) over 18%[1]. Recently metallooligomers containing Pt(II) metal based on diketopyrrolopyrrole are well used, since they display additional optical and opto-electronic features that leads to ultrafast photoinduced electron transfer and the increase of excitons population[2].

The optoelectronic properties of OSCs can be enhanced by tuning the structure of DPP to enhance electronic transfer between donor and acceptor and improving π-π inter-chain aggregation by self-assembly to favor charge carrier's mobility. The benefic impact of organizing groups triphenylene was highlighted with a PCE increasing from 7 to 13.26%[3]. To enhance the solar cell performances (PCE>15%), my project consists in improving the self-organization of the metallooligomers by ① using different types of spacer (nature/length) to increase solubility and organizational flexibility, ② changing the nature of organizing group to target face-on π-stacking orientation and ③ installing various terminal functions to graft easily the suitable organizing groups.

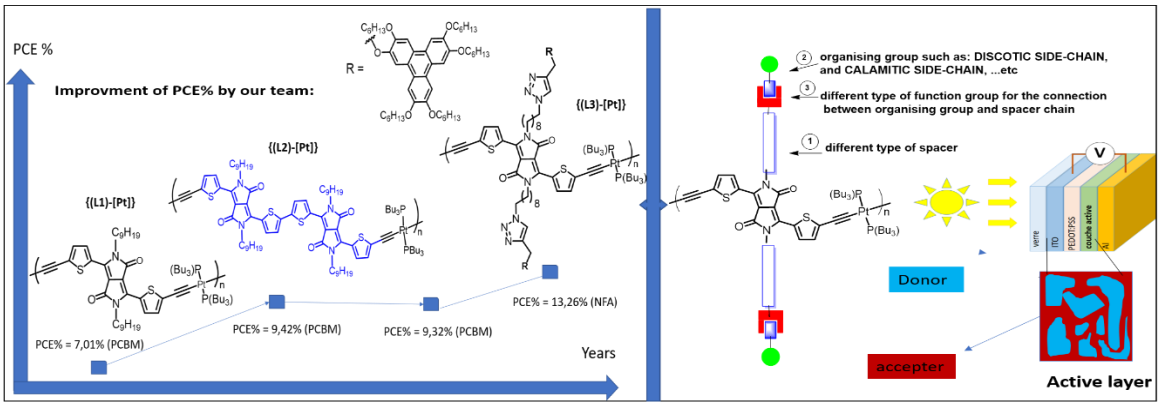

Figure 1: metallooligomers synthesized and the design of the new targets to enhance optoelectronic properties

References:

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