High Performance Acceptors for OSCs Based on Multi-dimensional Perylene Architectures

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Rylene dyes, which are based on naphthalene units linked in *peri*-positions, have attracted intensive attention in both theoretical and synthetic chemistry due to their perfect graphene-ribbon-like structures and attractive properties. They are recently emerging as promising key building blocks to create π-functional materials and have found use in a wide range of applications in optoelectronic devices.
This talk will focus on our recent progress in the design and synthesis of laterally expanded rylene dyes based on homo-coupling and cross-coupling reactions of core-functionalized PDIs to achieve novel high performance n-channel organic semiconducting materials. These new achievements offer opportunities to learn fundamental issues about how chemical and physical properties alter with incremental changes in structure. We highlight synthetic methodology of transition-metal mediated coupling reactions (and/or C-H transformation) for singly-linked, doubly-linked, and fully-conjugated triply-linked oligoPDIs. In addition, we summarize the informative correlations between the molecular structures and their optoelectronic properties. Finally, we introduce the promising applications of these laterally expanded rylene dyes as exceptional high performance n-channel semiconductors in organic field-effect transistors (OFETs) and competitive candidates for non-fullerene acceptors in high efficient organic photovoltaic devices (OPVs).

References

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