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Ultra-Thin Flexible OFETs Based on sp-Hybridized Organic Semiconductors and Insulating Polymer Blends

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The discovery of performant organic semiconductors, along with progresses in processing techniques and device engineering, is key to enable a plethora of applications in the field of large-area organic electronics, such as printed and flexible organic field-effect transistors (OFETs), wearable (bio)sensors, and neuromorphic devices. Lately, we have introduced *sp*-hybridized cumulenic carbon atom wires as a novel class of solution processable molecular semiconductors for organic electronics. [1,2] Carbon atom wires are linear chains of *sp*-hybridized carbon atoms with intriguing electrical, optical, and vibrational properties, which are not common to conventional organic semiconductors based on sp^2-hybridised carbon. [3]
We present here OFETs based on thin films of tetraphenyl[3]cumulene, the shortest semiconducting sp-carbon wire, displaying charge mobility in excess of 0.1 $cm^2 V^{-1} s^{-1}$ and promising operational stability in environmental conditions. [1] Furthermore, we discuss on our recent achievements in developing ultra-thin OFETs [4], employing a blend of tetraphenyl[3]cumulene and polystyrene. This strategy allows to combine the excellent charge transport properties of cumulenes with the higher flexibility typical of blends with insulating polymers.

References

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