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Crosslinked organosilica BTBTs for robust transistors

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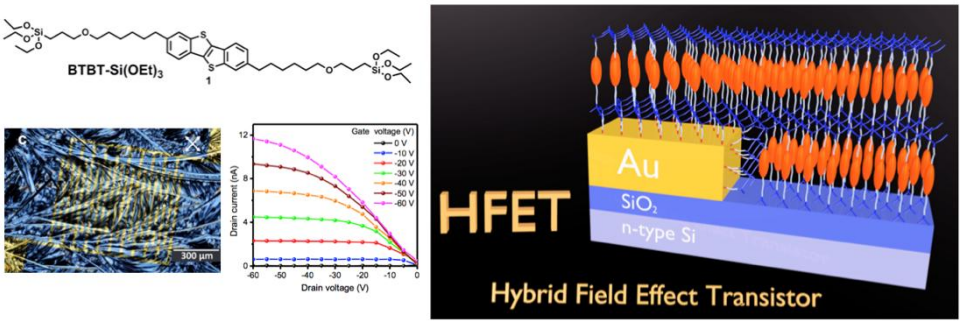
This communication will display the use of novel organosilica materials embedding π-conjugated moieties[1] as semiconductors into field-effect transistors. The π-conjugated core chosen is [1]benzothieno[3,2-b][1]benzothiophene (BTBT), first functionalized with hydroxyl groups[3] and then modified with hydrolysable and cross-linkable triethoxysilyl moieties. After polycondensation, this compound forms a hybrid material found to be a semiconductor. Taking advantage of the sol-gel chemistry involved here, fully cross-linked transistors. Molecules are cross-linked to each other, covalently bonded to the silicon oxide dielectric and also covalently bonded to the gold electrode thanks to the use of an appropriate surface modifier in between. This is the first report of fully covalent transistors[4]. Those devices with low mobility (10^{-5} $cm^2.V^{-1}.s^{-1}$) show impressive resilience against polar, aliphatic and aromatics solvents. Our latest progress has enabled to better control the packing of molecules in Herringbone scheme, reaching now state-of-the-art mobility over 0.01 $cm^2.V^{-1}.s^{-1}$ but keeping their extraordinary robustness thanks to their hybrid crosslinked nature[5]. The communication will also open to the first organic semiconductor having a Negative Thermal Expansion (NTE) with the highest NTE coefficient of all organic compounds, opening the route to new sensing applications [6].



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