HYBRID ORGANIC DEVICES FOR ADVANCED APPLICATIONS

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Current applications keep elevating demands for functionality and versatility of core units constituting contemporary micro- and nanoelectronic devices. The strategy of gross increasing of transistor density to keep Moore's law working is not a solution to satisfy rapidly growing computational power hunger. A new type of transistor that is able to combine several critical functions or can operate in a completely different mode may pave the path to the solution.

Combining of the advances of classic (inorganic) and new (organic) devices is of special interest as promises new breakthroughs that allow to overcome existing limitations of mainly inorganic present electronics.

Frontiers of modern organic electronics act as a flexible playground where emergent ideas readily evolve from purely fundamental investigations to wholesale industrial applications.

One of such novel ideas based on implication of advanced physical principles suggests using of organic materials resided on the edge of Mott instability and adjusting the electronic state by the big difference of thermal expansion coefficients between the organic and inorganic counterpart in a single unitary device.

Exploiting of this principle has already provided unique devices such as an very high mobility organic transistors,1 transistors with superconductive channel triggered by electric field2 or light3 and ambipolar superconducting transistor.4 Spectacular performance and extreme functional flexibility are major but not all key factors that generate elevated interest to the hybrid devices of new type.

The virtues of hybrid organic/inorganic devices utilizing principles of advanced physics as well as its limitations will be discussed in the forthcoming lecture.

References
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