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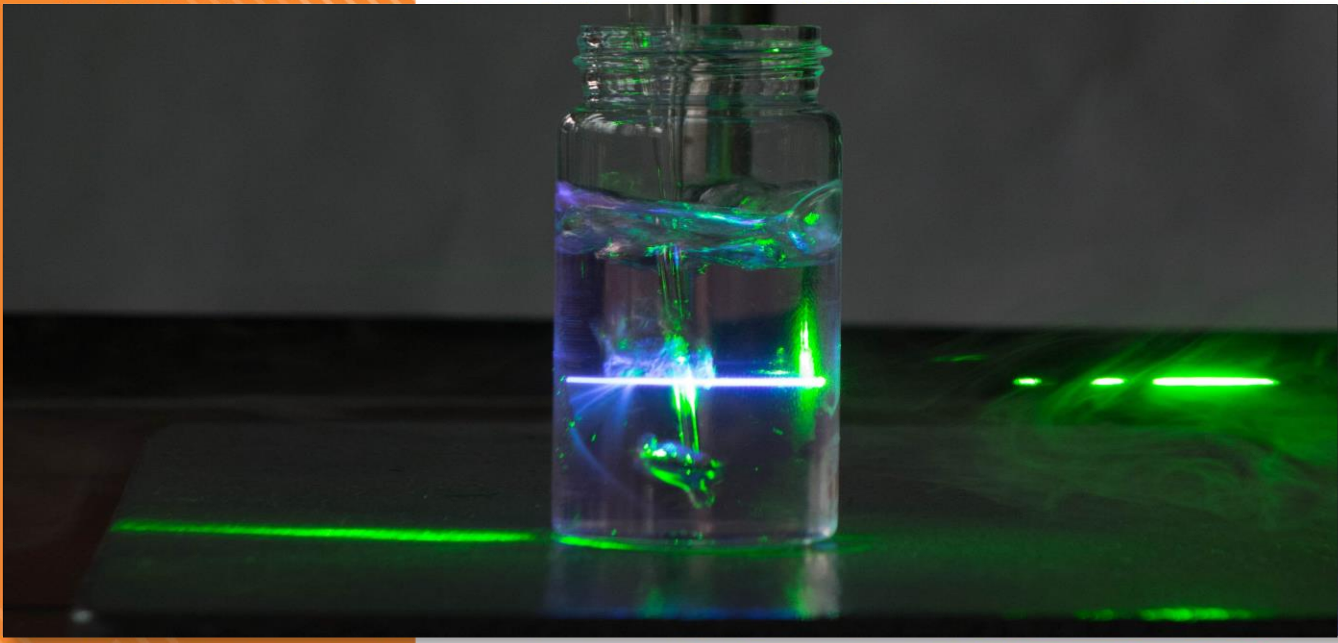

Inkjet-printed super-flexible oxide electronics and its application at sensor interfaces

Prof. Dr. Subho Dasgupta
Department of Materials Engineering,
Indian Institute of Science,
Bangalore, India

Printed electronics is a rapidly maturing field of research, where, high throughput fabrication of electronic devices are aimed at. Over the last two decades, printing of oxide semiconductors has attracted particular attention, however, challenges, such as limited flexibility, absence of performance-matched *p*-type semiconductors, inadequate reliability and large variability in printed TFTs etc. are certain showstoppers for which fully-printed circuits based on oxide semiconductors have rarely been reported in the literature.

In this seminar, some of these challenges will be addressed. In the beginning, an organic-inorganic hybrid semiconductor will be demonstrated that can combine the electronic transport of inorganic oxides with the ultra-flexibility of organic materials. Next, all-NMOS unipolar inverters will be shown that operates at deep-subthreshold (near off-state) regime, and thereby can demonstrate very high signal gain (η) coupled with low dynamic power dissipation. A set of benchmark circuit elements, ring oscillators, SRAMs etc, will be demonstrated. Next, the inverters will be further optimized to improve their noise immunity to be used to fabricate read-out electronics at the printed sensor interfaces. Common source amplifiers, differential amplifiers and analog-to-digital converters (ADCs) will be presented that operate at 1 kHz frequency and at a battery compatible operation voltage of ≤2 V. Finally, an effort towards further improvement in magnifying capacity weak signals will be demonstrated using so-called negative capacitance field-effect transistors (nc-FETs). Here, for the first time, fully-printed nc-FETs will be shown with subthreshold slope as low as 2 mV/dec and signal gain of the printed inverters >2000 when measured at a 5 mV step size. Interestingly, these nc-FETs can be achieved with both organic/inorganic and all-organic insulator stack and variety of semiconductor materials as the active layer. Unsurprisingly, the printed nc-FETs will show orders of magnitude low power dissipation, compared to the standard MOSFETs and would also exhibit memory behaviour with capacity of holding the charged-state for days.

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