# Development of printed flexible organic integrated sensors and circuits

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For at least the past 10 years, printed electronics has promised to revolutionize our daily life by making cost-effective electronic circuits and sensors available through mass production techniques, for their ubiquitous applications in wearable components, rollable and conformable devices, and point-of-care applications [1]. While passive components, such as conductors, resistors and capacitors, had been already fabricated by printing techniques at industrial scale, despite the great potentiality, printing processes have been struggling to meet the requirements for mass-produced electronics and optoelectronics applications [2]. In the case of logic integrated circuits (ICs), the main limitations have been represented by the need of suitable functional inks, mainly high-mobility printable semiconductors and low sintering temperature conducting inks, and evoluted printing tools capable of higher resolution, registration and uniformity than needed in the conventional graphic arts printing sector [3].
In this presentation, I will give a talk on the recent progressive of my group on development of printed organic flexible integrated circuits. I will mainly talk about on development of high performance inkjet printed unipolar and ambipolar polymer field-effect transistors (FETs), and applications to elementary organic complementary inverter, ring oscillators and various logic circuits. Several issues should be addressed including method to improve charge injection properties, reducing operating voltage, and deposition over a large area by graphic art printing processes. By optimizing gate dielectrics, printing processes, contact resistance, and mobility of organic semiconductors, we have obtained high field-effect mobility more than 5 $cm^2/Vs$ for both of p-channel and n-channel FETs with less than 10 V operating voltage, and ambipolar OFETs and the CMOS polymer ring oscillator showed very high operating frequency over 100 KHz. In addition, various logic circuits such as NAND, NOR, and XOR etc. were demonstrated as well.

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**References**

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