ERATO SEMINAR

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Printed Intelligence Technology at VTT

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VTT Technical Research Centre of Finland

Date & Time: October 31st (Wed), 2012, 16：00 - 17:00

Place: Meeting Room 2 (33B2), Engineering Bldg 2, The University of Tokyo

Abstract: Printed intelligence are components and systems which extend the functions of printed matter beyond traditional visually interpreted text and graphics, and perform actions as a part of functional products or wider information systems. VTT has investigated and developed enabling technologies for printed intelligence, electronics and optics and their applications with a vision that 'electronics and functionalities from inks', manufactured by printing like 'continuously running' methods, enables cost efficient integration/embedding of intelligence everywhere.

The enabling technology strategy rely on seamless development of material-process-device combinations and their integration to functional systems. The multidisciplinary material portfolio consists of commercially available and own materials. Conductive, metallic and nanoparticulate inks, organic and inorganic semiconductors, dielectrics, bio and biodegradable inks, etc., have been developed and tailored fluid-processable in our processes. The processing portfolio is very much built on continuously running roll-to-roll processing vision on large areas, and mostly additive printing-like methods like gravure, flexo, rotary-screen printing, but extended with compatible processes like hot-embossing, R2R-laser-processing, UV-nanoimprinting, electrical sintering, as well as ink-jetting, etching, lift-off and evaporation for special purposes. Processing technology development includes printed thin film (30-300nm) fabrication capability for multilayer functional components like OLED, OPV and OTFT. Printed electronic and optoelectronic components like resistors, capacitors, inductors, antennas, transistors, light emitting devices like OLED and LEC, display elements like electrochromics, organic photovoltaic and sensor elements, chemical functional devices, biosensing devices, biofuel cell and different battery and supercapacitor elements have been developed using R2R-processing technology. New device structures open a lot of opportunities for innovation but also a lot of challenges for material and processing development.

Above mentioned components and devices are used as building blocks for system solutions and products. We can look at this both from disruption or evolution direction. In disruption vision R2R-printed manufacturing technology opens new disruptive applications like disposable diagnostics and bioactive paper, large area sensors and user interfaces, interactive and smart packaging, tag and code technologies for ICT and hybrid media applications, etc. From the evolution direction electronics - in addition to ever increasing performance and miniaturization - moves towards flexible and 3D forms – also described as 'soft electronics'. In this more-than-Moore vision all available 'power and performance' of electronic, MEMS and silicon chips will be combined on flexible/printed/large-area platforms by hybrid technology integration for the purpose of future consumer electronics applications. Our main application interests are in medical and diagnostics, consumer electronics, consumer packaging, and constructions and energy. Several demonstrators will be shown. In our vision printed intelligence enabling technology will be in important role of cost-efficient manufacturing of future electronics products.

In addition to technology development we are actively building capabilities in industrialisation and commercialization. It is important to introduce new technologies from lab to early market trials and commercial adoption. PrintoCent Roll-to-Roll and Hybrid integration pilot-factory was inaugurated March 2012 and is offering with its six pilot lines scaling-up manufacturing, demonstration and piloting services. PrintoCent industrial members ecosystem, entrepreneurial activities and creation of application driven value chains are focus efforts during next three years in commercialization.

Biography: Professor Harri Kopola is the Research Director of Microtechnologies and Electronics at VTT, Technical Research Center of Finland. Harri Kopola received Diploma in Engineering, Licentiate of Technology, and Doctor of Technology degrees in electrical engineering from the University of Oulu. In 1989 he was a postdoctoral fellow at the University of Ottawa and NRC, Canada. From 1990 to 1995 he was servicing the University of Oulu as a chief assistant, associate professor (1992-1994), and professor in electronics (1994-1995). He took 1995 the position as the research professor in optoelectronics at VTT. In addition 1998 - 2002 he has been also the responsible head of optoelectronics research and 2002-2005 research director at VTT Electronics in Oulu. January 1st, 2006 he was nominated the Research Director in 'Microtechnologies and electronics' at VTT. From August 2006 to December 2009 he was leading a new VTT spearhead program 'Center for Printed Intelligence'. He operates actively in European framework of 'Organic and large area electronics' and multidisciplinary printed intelligence international networks. From 1st January 2010 he has been continuing his duty as the research director and is responsible of VTT strategy and research portfolio on 'Microtechnologies and Electronics' including printed intelligence, photonics, micro and nanosystems, and diagnostic platform technologies. At a moment he is as a visiting professor at the University of Tokyo, Institute of Industrial Science.

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