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Printed Polymer Thin-Film Transistors for Flexible Display

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Here, we introduce our R&D status and strategies for printed electronics containing the two types of aspects such as materials and process/architectures. Specially, in this talk, we focus on the high-performance polymer thin film transistors (PTFTs) backplanes fabricated by ink-jet printing using new polymer semiconductors for the applications of flexible display.

Keywords: Polymer transistor, Printing process

SB-4

Inorganic Printable Materials for Thin-Film Transistors: Conductor and Semiconductor

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For the past a few years, we have intensively researched the printable inorganic conductors and ZnO-based amorphous oxide semiconductors (AOSs) for thin-film transistors. For printable conductor materials, we have focused on the aqueous Ag and Cu ink which possess a variety of advantages, comparing with the conventional metal inks based on organic solvent system. The aqueous Ag ink was designed to achieve the long-term dispersion stability using a specific polymer which can act as a dispersant and capping agent, and the aqueous Cu ink was carefully formulated to endow the oxidation stability in air and even aqueous solvent system. The both inks were successfully printed onto either polymer or glass substrate, exhibiting the superior conductivity comparable to that of bulk one. For printable ZnO-based AOSs, we have researched the noble way to resolve the critical problem, a high processing-temperature above 400℃, and recently discovered that Ga doping in ZnO-based AOSs promotes the formation of oxide lattice structures with oxygen vacancies at low annealing-temperatures, which is essential for acceptable thin-film transistor performance. The mobility dependence on annealing temperature and AOS composition was analyzed, and the chemical role of Ga are clarified, as are requirements for solution-processed, low-temperature annealed AOSs.

Keywords: Printable, Inorganic, Semiconductor, Conductor, Thin-Film Transistor