

## Solution Process & Materials for Flexible SALSA OTFT Array on Plastic

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Organic thin-film transistors (OTFTs) can be manufactured using inexpensive solution process and direct printing processes rather than expensive vacuum deposition and photolithographic patterning. They have potential as building blocks for low-cost, flexible and large-area electronics. In spite of recent remarkable progress in printing technology, however, the alignment accuracy is still in the order of several tens micrometers which is not sufficient for applications. Breakthrough technologies are required which provide accurate definition of the device components and layer-to-layer alignment without increasing process complexity.

Recently we have proposed "*Self-Aligned Self-Assembly (SALSA)*" technologies where nano-materials such as metal nanoparticles and organic molecules are self assembled to form TFT array with micrometer resolution and the components of semiconductor and electrodes are substantially self-aligned to each other<sup>1)-3)</sup>.

In this paper, key issues in process, materials, and design which are integrated to realize flexible SALSA TFT array on plastic substrate are shown in order to inspire the relevant technologies<sup>4)</sup>.

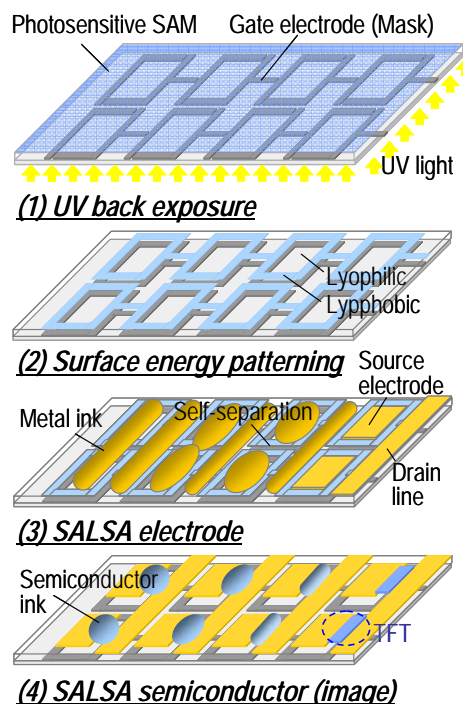
The SALSA process to fabricate TFT array is schematically shown in **Fig.1**. In the bottom gate and bottom contact configuration, (1) source and drain are formed reversely self-aligned to gate patterns, and (2) organic semiconductor (OSC) is formed reversely self aligned to the source and drain patterns. The source and drain are formed of metal ink confined in the gate reverse pattern on the gate insulator surface where hydrophobic pattern is formed by the self assembled monolayer

(SAM) patterned by the back exposure method. The self-aligned OSC is formed of the ink confined in reverse region of source and drain which are covered by another hydrophobic SAM.

In order to realize the SALSA solution process on plastic substrate, the following materials were newly developed; (1) hydrophobic SAM which are optically patterned by light which transmits plastic (>350nm), (2) epoxy-resin gate insulator with high transparency, low processing temperature, and high chemical stability to the OSC solvent.

### References

- 1) M. Ando et al., APL85, 1849 (2004).
- 2) M. Ando et al., Ext. Abst. IDW'06, 1699 (2006).
- 3) T. Arai et al., Jpn. JAP46, 2700 (2007).
- 4) T. Minari et al., APL92, 173301 (2008).



**Fig.1.** SALSA solution process