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Further development of plasma-assisted inkjet printing

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Further development of plasma-assisted inkjet printing, where inks during flight and after landing on a substrate are irradiated by atmospheric-pressure nonequilibrium plasma, will be presented. When the ejected ink was exposed to plasma, reactive species from the plasma as well as rapid and local heating are expected to promote various reactions. Thus plasma-assisted inkjet printing could provide various advantages to inkjet printing, such as less pre- or post-treatments, low-temperature and rapid sintering/reduction, narrower pattern width, and/or on-site polymerization. In the case with silver patterning using silver-nanoparticle-dispersed ink [1], compared with heat treatment, narrower line width could be achieved with low substrate temperature and a short single-step process. Furthermore, with poly(3,4-ethylenedioxythiophene) (PEDOT) pattern fabrication using 3,4-ethylenedioxythiophene (EDOT) monomer stock solution ink [2], plasma-assisted polymerization during printing process was demonstrated. Fabrication of gold patterns using particle-free aqueous chloroauric acid solution ink [3] was also achieved to demonstrate plasma-assisted reduction of ions to fabricate metallic patterns. Further details will be presented at the conference. [1] M. Tsumaki, K. Nitta, S. Jeon, K. Terashima, T. Ito, *J. Phys. D: Appl. Phys.* 51, 30LT01 (2018). [2] K. Nitta, M. Tsumaki, T. Kawano, K. Terashima, T. Ito, *J. Phys. D: Appl. Phys.* 52, 315202 (2019). [3] K. Nitta, K. Ishizumi, Y. Shimizu, K. Terashima, T. Ito, to be submitted.