

New methods of in-situ patterning of OLED emission area.

Amruth C, Wassima Rekab, Beata Luszczynska and Jacek Ulanski
Department of Molecular Physics, Lodz University of Technology, 90-924, Lodz, Poland.
Email: jacek.ulanski@p.lodz.pl.

In spite of tremendous progress in synthesis of new, solution processable materials suitable for printed organic electronics [1], this technique still remains as an unfulfilled promise and cannot overcome laboratory scale. Among different not solved yet problems, there are technological challenges related to printing techniques, such as difficulties with controlling morphology and geometry of printed active layers in a reproducible way; lack of efficient, industrial scale technology of assembling organic and inorganic components into working, functional electronic devices; difficulties in fabrication by printing multilayer structures.

In this work we demonstrate new approach to the inkjet printing technique, which is perhaps the most promising method among solution processable techniques for manufacturing of low-cost and high resolution Organic Light Emitting Diodes based displays [2, 3]. The film formation process is analysed and we present the comprehensive study of OLEDs with the inkjet printed TADF-based emissive layers [4] and the electron injection layers [5]. We have elaborated stable ink formulations suitable for industrial grade printing. The possibility of inkjet printing of efficient emissive layers or electron injection interlayers enables patterning of the emission area of OLEDs; an example is shown in Fig. 1. Such simple technique for patterning emission area can be applied to a wide range of printed displays such as signage, advertisements or smart packaging and, in our opinion, it is an important step towards printed electronics on industrial scale.

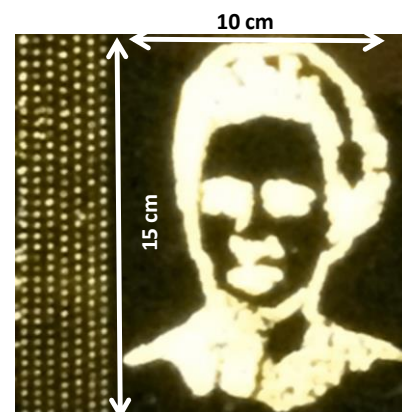


Fig. 1 Printed OLED with portrait of Marie Skłodowska-Curie.

ACKNOWLEDGMENTS: This work was supported by the grants: 674990 EXCILIGHT - H2020-MSCA-ITN-2015; 33 0355/PnH/2016 – MNiSW, Poland; TANGO2/340019/NCBR/2017 – NCBR, Poland.

REFERENCES

- [1] B. Luszczynska, K. Matyjaszewski and J. Ulanski (Eds); *Mobile Robots* **8** (2001) pp. 520-531.
- [2] A. C, B. Luszczynska, B. G. R. Dupont and Z. Sieradzki, *Display and Imaging*, **2** (2017) pp. 339–358.
- [3] A. C, M. Z. Szymanski, B. Luszczynska, J. Ulanski, *Sci. Reports*, **9** (2019), 8493
- [4] A. C, B. Luszczynska, M. Z. Szymanski, J. Ulanski, K. Albrecht, K. Yamamoto, *Org. Electron*, **74** (2019) 218-227
- [5] J. Ulanski, B. Luszczynska, A. C, J. Ulanski, *Method of OLED fabrication*, Polish Patent application nr: 430487 (2019)