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ELECTROSPRAY IONIZATION DEPOSITION OF ORGANIC POLYMERS UNDER VACUUM CONDITIONS

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In this paper, the Electrospray ionization (ESI) process was used to transfer organic molecules into vacuum. During ESI, the material is not thermal evaporated, but ionized and sprayed through an orifice into the vacuum. Therefore, also heavy, non-volatile molecules can be transferred into the gas phase and be coated on substrates, which are normally not suitable for common CVD or PVD vacuum processes. To use a material for the ESI deposition process, it has to be ionizable and solvable in a liquid solution with certain electrical conductivity.
The depositions were done with a homemade ESI-Tool that is described in detail in [1]. We deposited different heavy organic polymers (M≥100000 g/mol) like MEH-PPV and SPG034 (MERCK), which are used as functional material for OLED printing or spin coating. Solvents of these materials were prepared using chloroform and toluene. To enhance the electrical conduc- tivity, small amounts of dimethyl sulfoxide (DMSO) were added. We deter- mined the particle size in the liquid using dynamic light scattering. Ioniza- tion voltage, capillary-substrate-distance and the needle-capillary-distance were varied for certain experiments. The influences on the layer thickness distribution, roughness and deposition rate were investigated using profilometry. For 5 cm capillary-substrate-distance, a circular shaped deposition region with 8 mm diameter was observed. Substrates with different electrical conductivity (silicon, glass) were used to get information about the influence of the substrate potential on the layer formation.
ESI can also lead to fragmentation of molecules during the ionization pro- cess. Thus IR-spectroscopy has been used to determine the structure of the layers. To get information on the level of fragmentation, the spectra were compared with spectra of conventionally produced films by spin coating.

[1] D. Hecker, et.al.: Electrospray ionization deposition of BSA under vacuum conditions. In: Smart Sensors, Actuators, and MEMS VII, and Cyber Physical Systems, Proceedings of SPIE 9517, 2015, pp. 951729-951729-5.

Keywords
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