The influence of solvents on the morphology and the working parameters of the organic thin film transistors with *n*-type channel

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Organic electronics appear as very attractive alternative solution to traditional silicon technology to produce integrated electronic circuits. Organic materials offer possibility of easy, energy-saving processing and allow decreasing costs of manufacturing. Organic semiconductors can be processed at much lower temperatures compared to silicon technology and this makes them compatible with flexible polymer substrates [1]. Solution-based techniques such as spin-coating allow to prepare thin layers of organic semiconductors which can be used to build organic thin film transistors (OTFTs), however in order to obtain the layers with desired morphology it is necessary to determine the processing conditions.

In this work we present OTFTs based on 2,9-di(pent-3-yl)anthra2,1,9-def:6,5,10-d'e'f'diisoquinoline-1,3,8,10-tetrone (PTCDI-C5). In order to verify the influence of the solvents on the morphology of the prepared layers and consequently of the devices parameters three different solvents were used: chloroform, chlorobenzene and 1,2-dichlorobenzene. The layers of PTCDI-C5 were deposited on glass substrate and the transistors were prepared in the top gate bottom contact configuration, with Parylene C [2] deposited on the top of the PTCDI-C5 layer as the dielectric and protective layer. Morphology of the obtained PTCDI-C5 layers was investigated by Atomic Force Microscopy which shows significant differences in morphology of the layers fabricated with use of different solvents (fig. 1).

The spin-coated layer prepared form chlorobenzene consists of elongated crystals aggregated in a form of bundles, while in the layer prepared from chloroform one can see rather small, plate-like crystals. It appears that size and shape of the obtained crystals have significant influence on the OTFT working parameters. The devices based on the layers prepared from chlorobenzene exhibit higher electron mobility and lower threshold voltage than the devices prepared from chloroform.

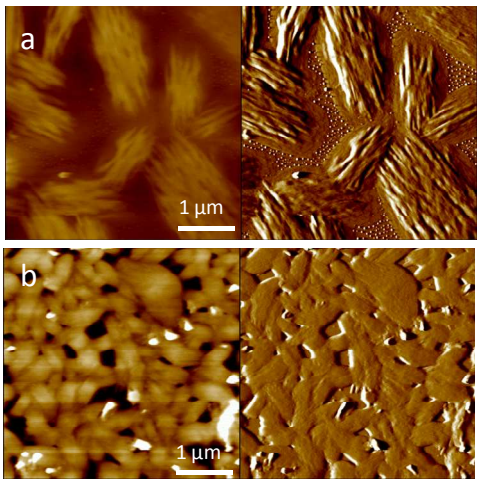

Fig. 1. The AFM image of PTCDI-C5 layers prepared from a) chlorobenzene and b) chloroform solution.

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