ALIGNING INTERDIGITATED CONDUCTIVE POLYMER AND METAL ELECTRODES USING STEP&STAMP IMPRINT LITHOGRAPHY

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The principle of the imprint lithography is simple and it has been used to create submicron structures into polymers for several years. In addition to cost beneficials due to simple process the imprint lithography can be used for patterning directly to various surfaces, e.g. conductive polymers [1], as far as the material is deformable physically by molding. This means, that the applications of imprint lithography are not restricted to semiconductor manufacturing. The patterning facility needs only a mold and a press that can be used to push the mold onto the substrate. Step & stamp approach [2] in imprint lithography can compete with other novel lithography techniques with low-cost and versatility, since it can be applied to fabricate various size and shape structures into various substrates.

In this work we study the possibility to align conductive polymer interdigitated fingers to predefined metal electrodes on silicon substrate. The optical alignment system of the FC150 Flip Chip bonder makes possible to perform multilayer lithography. The principle of the process is shown in Fig.1.

The stamp was made of silicon and patterned finger structures with UV-lithography and dry etching. The line width of the fingers in the stamp is 5 µm with 5 µm spacing. The trenches in the stamp are 300 nm deep. The metal electrodes were defined on silicon substrate by e-beam lithography and lift-off process is used to realize gold or aluminum electrodes. The width of the metal electrodes is below 200 nm with spacing of 5 µm. The substrate was spin coated with PANI-DBSA in toluene solution and electrodes imprinted with process shown e.g. in Ref [3]. Printed polymer electrodes is aligned between metal electrodes of the substrate. The stamp is pressed onto polymer at room temperature and released after moulding is completed. In the final step the residual PANI-DBSA is removed by RIE in oxygen plasma to separate polymer fingers from metal electrodes.

Metal electrodes are investigated by optical microscope, AFM and electrical measurements. Using of metal-polymer electrodes e.g. in organic light emitting device (OLED) [4,5] for giving suitable energy barriers to device is discussed.

References:

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Figures:

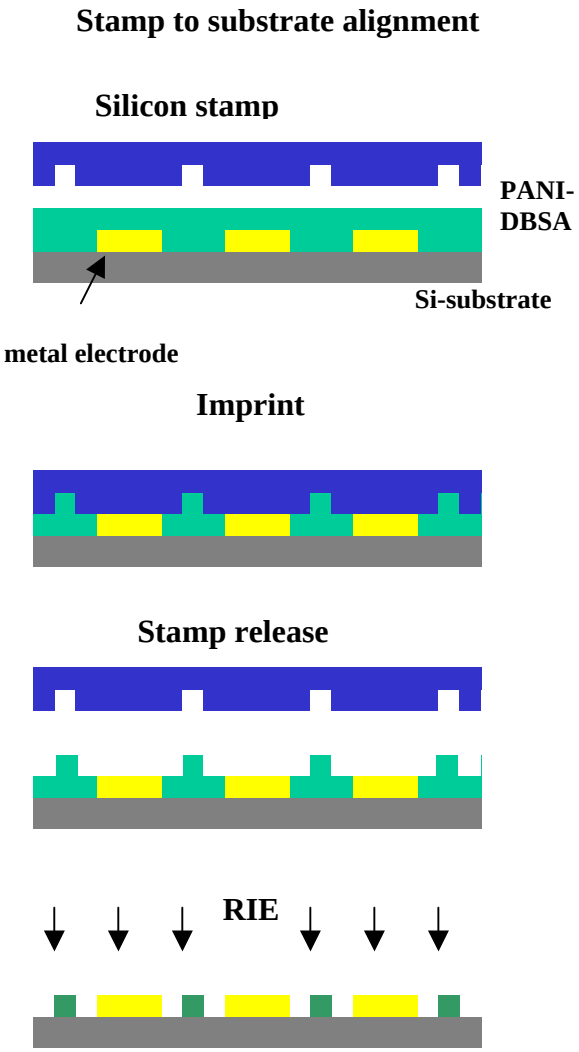

Figure 1. The schematic of aligning PANI-DBSA fingers between metal electrodes by SSIL.