

Functionalization of graphene based sensors by organic molecules using inkjet printing technology

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Abstract

Devices based on graphene can be used in such areas as medicine, various industries, flexible electronics, and etc. This devices using graphene as sensor structures, but to make them usable they need to be functionalized in some way. Changing properties of graphene by functionalization it will be possible to create devices such as photodetectors, sensors for toxins and various gases, transistors. There are different ways to functionalize graphene: chemical functionalization in solutions [1], UV or laser irradiation [2, 3], molecules deposition [4] and others.

In our work we are using deposition of molecules by ink-jet printing technology on CVD grown graphene on Si substrates and formed transistor structures. To deposit molecules from solution by ink-jet printing ink must be viscous enough, have low volatility, to make a single drop from printer nozzle, so viscosity limit is 2-30 cP and boiling point must be higher than 100 °C [5]. Polyaniline (PANI), quaterthiophene (HEX), and perylene dicarboximide (PDI) were used as functionalizing molecules. As solvents for such molecules n-methyl-2-pyrrolidone, chlorobenzene and toluene for PANI, HEX and PDI, respectively were used. Also for viscosity increasing isopropanol was used in solution. The ink was placed in the head of the printer and successfully printed on the structures.

References

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Figures

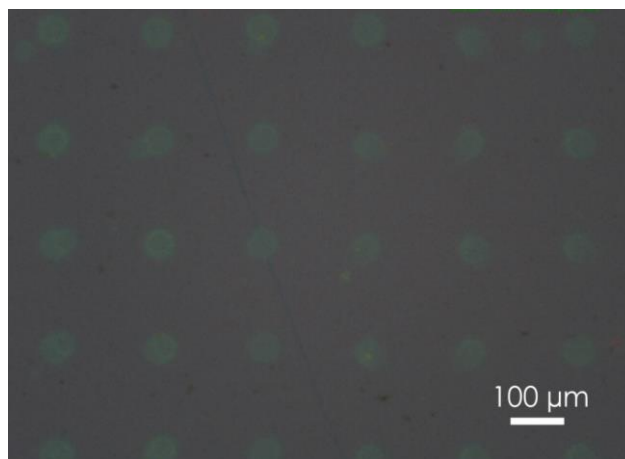


Figure 1: PDI drops deposited on graphene sheet

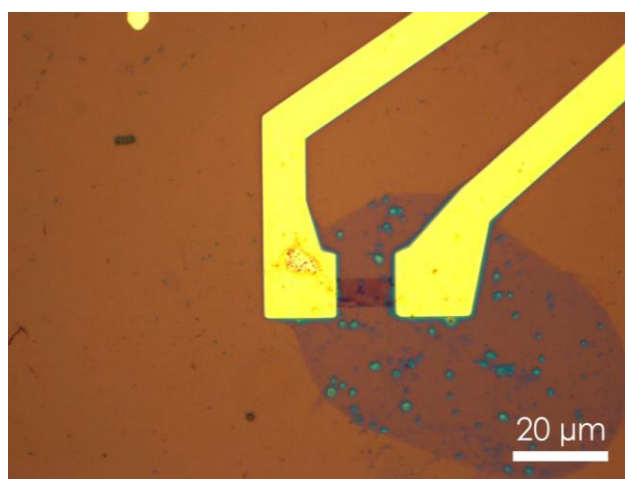


Figure 2: HEX deposited on graphene transistor