

## **Graphene based materials for 2D printed technologies**

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Nowadays, there is a constant progress in the use of printable electronic components for developing flexible, smart, cheap, disposable and large area devices for a wide spectrum of applications. Performance of modern printed devices is limited by the quality of the materials contained in the inks and how these materials are arranged on the target substrate. For instant, organic materials, as a rule, have significantly limited stability, reliability and durability of the resulting device. Graphene and other two-dimensional (2D) materials can be a solution of these problems due to very promising physical and chemical properties even in the forms of films created from liquid compositions. The appearance of new graphene based materials and expansion of possible applications of 2D printed materials for modern electronics and photonics are expected in the near future. Utilization of graphene and other 2D materials for printed technologies of electronics and photonics devices is discussed in the present review. The main approaches for creation of graphene or chemically modified graphene suspensions, properties of printed layers and devices, and general development trends of the printed technologies are analyzed. It was demonstrated that liquid composition of inks is nowadays changed: organic components are substituted for water-based solutions. There are also tendencies to use the inks with increasingly high concentrations of graphene, whereby these layers have a high conductivity, and widening a set of materials for 2D printed technologies. Results of our studies aimed to creation of printed heterostructures with graphene based conductive and fluorinated graphene based insulated layers are also considered in the report.