Graphene-based transparent capacitive touch sensor for in-mold structural electronics

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The explosion of user interfaces, displays and touch sensors in everyday life translates into a growing demand for transparent electrodes with unusual formats (3D shapes vs flat surfaces) and mechanical properties (e.g. wearable, bendable, stretchable) [1-3]. This represents a key differentiator for graphene-based materials in the highly competitive market of transparent conductive films [4]. In this work we demonstrate the potential of chemical vapor deposited graphene as transparent electrodes for in-mold structural electronics applications. We report the development of a 3D-shaped, overmolded transparent capacitive touch sensor with good optical properties and sensing capabilities enabled by graphene electrodes. A dedicated process flow was developed to integrate CVD graphene electrodes in the fabrication of capacitive touch sensors on large size (32 x 38 cm²) flexible substrates. We discuss the transfer and processing of monolayer graphene on both faces of polycarbonate substrates. We demonstrate for the first time both the thermoforming of graphene electrodes (to give a 3D shape to the device, Fig. 1a) and the injection molding of graphene electrodes (to overmold in plastics the device, Fig. 1b). A functional double layer capacitive touch sensor demonstrator integrating bilayer graphene electrodes with a 3.5 x 4.5 cm² active area is fabricated. The overmolded device exhibits excellent optical properties (86.6% transmittance at 550 nm with only 1.2% of haze) and good sensing capabilities including multi-touch and gesture interpretation.

References

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Figures

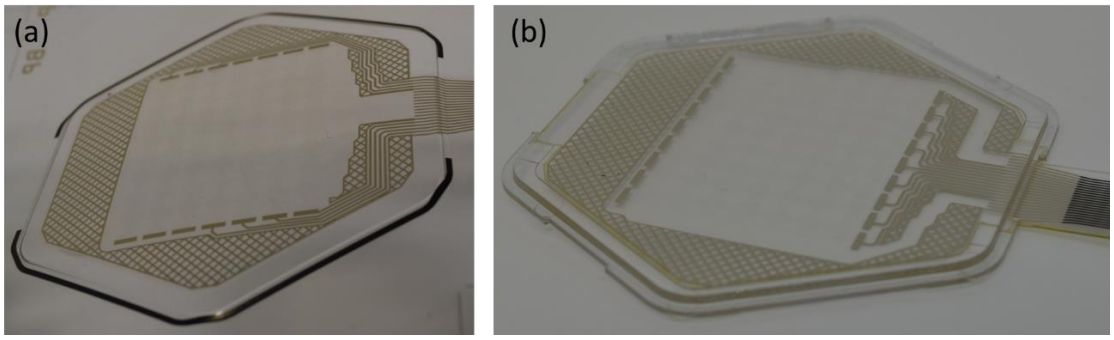

Figure 1: 3D-formed (a) and overmolded (b) transparent graphene electrodes (3.5 x 4.5 cm² active area) after patterning, contacting and encapsulation.