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

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Context

Explosion of human-machine interface market, e.g. home appliances & automotive interior design

- Growing demand for free form transparent electrodes (3D, bendable, stretchable)
- Key opportunity for nanocarbon & graphene materials

Graphene integration in 3D overmolded transparent touch sensor

1. Graphene synthesis & transfer

Graphenea

Two-sided transfer on large size flexible substrate

- Polycarbonate, 32 cm x 38 cm
- 7 cm x 7 cm bilayer graphene on both sides

2. Graphene patterning & contacting

Patterning by pulsed laser ablation

Screen printing of contacts & encapsulation

- Ag contacts
- Transparent encapsulation

3. Thermoforming

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Giving a 3D shape to touchscreen

- Industrial mold
- Two-sided interlocking diamond pattern
- 3D formed graphene touchscreen

4. Injection molding

Symbiose

Overmolding touchscreen in plastics

- In-mold graphene touchscreen

Optical & electrical performances

Impact of processing on bilayer graphene on polycarbonate performances

- Sheet resistance (Ω/sq.)
- Transmittance @550 nm (%)

- No resistance increase upon thermoforming of graphene lines
- Encapsulation degrades both electrical & optical performances

In-mold graphene structural electronics

Graphene touchscreen demonstrator with multi-touch & gesture interpretation:
- (a) double-click
- (b) two-finger zoom
- (c) drawing (d) right swipe

- An in-mold, transparent, capacitive touchscreen (multi-touch and gesture) with two-sided bilayer graphene electrodes
- Excellent optical properties (86.6 % transmittance @550 nm with only 1% haze with optimized encapsulation)

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ACKNOWLEDGEMENTS

This work was financially supported by the European Commission under the project Graphene Flagship (contract no. 785219).