From R&D to product: development of new interactive products with integrated printed electronic solutions

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Printed sensors are intrinsically flexible, lightweight, ultra-slim and cheap, being particularly suitable to be embedded in conventional products. Their widespread applicability has prompted the scientific-technologic development of printed sensors, sensible to diverse properties such as temperature, humidity, pressure, chemicals, light, etc. Target applications include environmental monitoring (e.g. radiation tags), biomedical devices (e.g. disposable biosensors), robotics (e.g. smart skin) and smart packaging (e.g. temperature tracking, safeguard product authenticity).[1-2]

Printing processes like screen-printing, inkjet, flexography or rotogravure, allow direct and reproducible sensor integration on a wide variety of substrates, with reduced integration costs and high throughputs which makes them suitable for large scale production.

At CeNTI we have been developing integrated printed integrated electronic solutions, using high throughputs processing technologies, such as screen printing and rotogravure. One example is fringing field capacitive sensors that have the advantage of allowing noncontact measurements, as the fringing field is projected into the object being detected, without changing the electrode configuration.

Due to the nature of the collaboration between CeNTI and industrial partners, the scalability of the processes that are used is one of the major focuses of the scientific and technological approaches. In the development of the printed electronic devices an integrated and multi-disciplinary approach has been taken comprising different steps, such as design optimization, deposition and characterization of the devices. Also the integration of the printed devices with acquisition system, treatment and transmission of data is addressed.

One of the biggest challenges is the integration of printed electronics in daily objects without changing significantly their performance and functionality. These challenges involve both scientific and technological barriers that must be addressed simultaneously in a multidisciplinary approach.

CeNTI is currently participating in several projects that require the integration of printed electronic for liquid level measurement, object detection and identification, interaction with objects and people. Comparison of theoretical and experimental results of these projects will be presented, based on numerical simulations and different characterization techniques such as optical microscopy, AFM, electrical and impedance analysis and profilometry.

References

[1] H. Igbenehi, R. Das, Printed and Flexible Sensors 2012-2022: Forecasts, Players, Opportunities, IDTechEx, 2013.
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