

Towards Printed Green Time-Temperature Indicator

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Abstract : To reduce the global waste of perishable goods, a solution for monitoring and traceability of their environmental conditions is needed. Temperature is the most controllable environmental parameter determining the kinetics of physical, chemical, and microbial spoilage in food products. To store the time-temperature information, time-temperature indicator (TTI) is a promising solution. Printed electronics (PE) has shown a great potential to produce customized electronic devices using flexible substrates and inks with different functionalities. We propose to fabricate a hybrid printed TTI using environmentally friendly materials. The real-time TTI profile can be stored and transmitted to the smartphone via Near Field Communication (NFC). To ensure environmental performance, Canadian Green Electronics NSERC Network is developing green materials for the ink formulation with different functionalities. In terms of substrate, paper-based electronics has gained the great interest for utilization in a wide area of electronic systems because of their low costs in setup and methodology, as well as their eco-friendly fabrication technologies. The main objective is to deliver a prototype of TTI using small-scale printed techniques under typical printing conditions. All sub-components of the smart labels, including a memristor, a battery, an antenna compatible with NFC protocol, and a circuit compatible with integration performed by an offsite supplier will be fully printed with flexography or flat-bed screen printing.

Keywords : NFC, printed electronics, time-temperature indicator, hybrid electronics

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