

Environmental Assessment of Roll-to-Roll Printed Smart Label

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Abstract : Printed electronics are a fast-growing market as their applications cover a large range of industrial needs, their production cost is low, and the additive printing techniques consume less materials than subtractive manufacturing methods used in traditional electronics. With the growing demand for printed electronics, there are concerns about their harmful and irreversible contribution to the environment. Indeed, it is estimated that 80% of the environmental load of a product is determined by the choices made at the conception stage. Therefore, examination through a life cycle approach at the developing stage of a novel product is the best way to identify potential environmental issues and make proactive decisions. Life cycle analysis (LCA) is a comprehensive scientific method to assess the environmental impacts of a product in its different stages of life: extraction of raw materials, manufacture and distribution, use, and end-of-life. Impacts and major hotspots are identified and evaluated through a broad range of environmental impact categories of the ReCiPe (H) middle point method. At the conception stage, the LCA is a tool that provides an environmental point of view on the choice of materials and processes and weights-in on the balance between performance materials and eco-friendly materials. Using the life cycle approach, the current work aims to provide a cradle-to-grave life cycle assessment of a roll-to-roll hybrid printed smart label designed for the food cold chain. Furthermore, this presentation will present the environmental impact of metallic conductive inks, a comparison with promising conductive polymers, evaluation of energy vs. performance of industrial printing processes, a full assessment of the impact from the smart label applied on a cellulosic-based substrate during the recycling process and the possible recovery of precious metals and rare earth elements.

Keywords : Eco-design, label, life cycle assessment, printed electronics

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