The potential of 3D Plastronics: from packaging to ecofriendly innovative systems

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3D Plastronics makes it possible to integrate heterogeneous functions on polymer packaging or cases of electronic systems, which are no longer limited to the mechanics. The principle consists of arranging conductive tracks and electronic components, such as surface-mounted components (SMDs), on the 3D surface of the devices, in order to simplify connections and improve the interaction of electronic, mechatronic, optical and/or thermal functions.

Industrial processes already exist for the mass production of plastronic parts and will be briefly recalled during the presentation. These are direct patterning (LDS), two-shot injection molding and the newer process, which is In-Mold Electronics on Polycarbonate substrate.

In this context, the roadmap of the research project at AMPERE on the innovative fabrication of plastronic devices will be discussed with a focus on two examples.

The first example that will be reported is the In-Mold Electronics on Poly Lactic Acid (PLA) [1]. PLA is indeed the most important bio-based polymer and it has been possible to develop a circular economy process including dismantling and recycling. The potential of such a process for mass production will be discussed.

The second process is related to the prototyping of plastronic devices starting from 3D printed polymer parts. Different options for the printing technologies (stereolithography, wire 3D printing, composite printing), the polymers (photosensitive resins, composites, standard or technical thermoplastics) and the metallization (elecroless deposition, conductive inks) will be briefly reviewed.

The potential of 3D Plastronics for the research in different fields will be illustrated: Health (MRI sensors [2]), Power Electronics (cooling [3]) and IoT (antennas, rectennas [4]).

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