

In the field of printed electronics, a key challenge is to reduce the environmental impact through innovative materials and surface coatings. SmartSens project focuses on the development of an innovative screen-printed biosensor system for the detection of nucleic acids, with a particular focus on the detection of PIK3CA point mutations in circulating tumour DNA that can be analysed during liquid biopsy for breast cancer therapy.

To achieve this goal, the project will investigate several innovative materials starting at TRL 2 stage of development: a) biopolymer-based microfluidics, b) stimuli-responsive cellulose DNA purification materials, c) copper nanowire screen-printing pastes and d) thin films for non-enzymatic, label-free DNA sensing. In conclusion, SmartSens project will investigate and develop innovative materials with an end TRL 4, which are of great importance not only for biosensors and medical technology, but also for the wider field of printed electronics.

The environmental performance of the innovative materials and biosensors developed within SmartSens project will be quantified by Life Cycle Assessment (LCA) considering the full life cycle (from raw material production to product disposal, including recycling). Following a “sustainability-by-design” approach, the environmental impact of developed products will be assessed using cradle-to-cradle and cradle-to-grave models and compared with currently used solutions. The LCA analysis will ensure that the developed within project solutions are in line with environmental and climate goals and with the circular economy concept.