

openLCA and OpenSemanticLab - Build a Digital Bridge between Material Science and Life Cycle Assessment (LCA)

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Safety and sustainability by design (SSbD) is nowadays an important aspect in material science. Nevertheless these key aspects are seldom included in early stage development, where critical decisions about the paths to explore are made. This is due also to the disconnection of both the human experts and the data structures in the material science and sustainability domains. To overcome the lack of a common language we have created a linked data schema for an electronic lab notebook which is compatible to the openLCA data schema.

The approach is based on JSON-LD shaped with JSON-SCHEMAS which are also used to generate a web user interface with the OpenSemanticLab software stack.

The user interface enables any material scientist to feed data (processes/materials) directly from the lab, requiring only a web browser and no specific know-how neither on JSON-LD nor on openLCA.

The interface to openLCA is based on simple python app that allows to query and select process entities, automatically maps them to the target format and downloads the result as openLCA ZIP-Archive. While doing so, existing openLCA definitions like properties, units and existing flows are referenced and not duplicated by using mapping terms or user annotations.

This allows materials researchers to create a knowledge graph of their experimental setups which can be converted automatically to openLCA flows and processes. Semi- or fully automated predefined assessments by LCA experts can then evaluate various scenarios and provide an early and fast feedback to the materials researcher. In this talk we demonstrate this approach for the use case of paper-based electronics and elaborate on the potential of a strong coupling between materials and sustainability research from an early development stage.

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