An actionable inventory of material data characteristics based on MSE ontologies

Andreas Räder[1], Matthias A. Popp[2], Lukas Gold[2] and Simon Stier[3]

[1] Dep. Digital Transformation, Fraunhofer ISC, 97082 Würzburg, Germany; andreas.raeder@isc.fraunhofer.de; https://www.isc.fraunhofer.de/en/fields-of-activity/applications/digital-transformation.html

[2] Dep. Digital Transformation, Fraunhofer ISC, 97082 Würzburg, Germany; matthias.albert.popp@isc.fraunhofer.de; https://www.isc.fraunhofer.de/en/fields-of-activity/applications/digital-transformation.html

[2] Dep. Digital Transformation, Fraunhofer ISC, 97082 Würzburg, Germany; lukas.gold@isc.fraunhofer.de; https://www.isc.fraunhofer.de/en/fields-of-activity/applications/digital-transformation.html

[4] Dep. Digital Transformation, Fraunhofer ISC, 97082 Würzburg, Germany; simon.stier@isc.fraunhofer.de; https://www.isc.fraunhofer.de/en/fields-of-activity/applications/digital-transformation.html

Key Words: *Linked Data, Schema, Pattern, Characteristic, Ontology*

Abstract

The interoperable description of material properties is a key element in both material research and material related value chains. Particular interest regarding data interoperability has been growing around product passports. For example, driven by the European Regulation on Battery Passports, various initiatives like BatteryPass and Catena-X have drafted machine readable schemas for corresponding technical and organizational battery characteristics. Despite modelling the same asset based on the same regulation different initiatives came to diverging results and their perspective on materials remains shallow. However, having the public data schemas at hand the mapping and merging of them becomes feasible. In addition, we face various ontologies just for physical quantities and units while those for material properties and characteristics are still emerging (e.g. EMMO, PMDco, IOFMaterials). We therefor picked up the path and extend those resources to a growing catalog of interoperable data characteristics in order to ensure both FAIR research and compliance with industry requirements. By using semantically annotated data schemas (OO-LD) based on de-factor industry standards JSON-SCHEMA and JSON-LD we also provide machine generated and AI actionable interfaces to read, write and translate data described by those schemas both inside and outside the OpenSemanticLab (OSL) software stack. For the latter we defined first mappings to other popular schema languages like AAS/SAMM, dlite, and NOMAD ELN Schemas.