Knowledge representation of battery manufacturing supported by an integrated ontology system

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Abstract

The fast moving field of battery technologies including variations of materials and manufacturing processes requires decision support that is based on a knowledge base that represents and integrates the multiple chemistries, processes, data sources (e.g. sensors), characterisation methods etc. Moreover, a digital twin approach also needs to relate the virtual representation to "real" data. We present a single conceptual framework of all the diverse knowledge sources relevant to constructing a battery Digital Twin in the BatCAT project [1]. The project compiled an extensive set of competency questions and relevant metadata and mapped them to existing ontologies, in particular to the growing ecosystem of EMMO [2] and its domain ontologies, including CHAMEO [3], the Battery Testing Ontology [4], the Battery Interface (BattInfo) and Battery Domain Ontology [5], and the Battery Value Chain Ontology (BVDO) [6]. The resulting EMMO-based BatCAT ontology will be presented, requiring very few additional concepts. BatCAT will therefore contribute to achieving semantic interoperability in the battery domain.

Acknowledgements

References

[1] Battery Cell Assembly Twin (BatCAT) http://www.batcat.info/

[2] Elementary Multiperspective Material Ontology, https://github.com/emmo-repo/emmo

[3] Characterisation Methodology Domain Ontology (CHAMEO), https://github.com/emmo-repo/domain-characterisation-methodology

[4] Battery Testing Ontology, https://github.com/emmo-repo/application-battery-testing-ontology

[5] BattInfo and Battery Domain Ontology, https://emmo-repo.github.io/domain-battery/index.html

[6] Battery Value Chain Ontology, https://github.com/Battery-Value-Chain-Ontology/ontology