Metallic and complex hydrides may act as anode and solid electrolytes in next generation of lithium batteries. Based on the conversion reaction with lithium to form LiH, Mg- and Tibased anode materials have been tested in half-cell configuration with solid electrolytes derived from the hexagonal high temperature modification of the complex hydride LiBH4. These anode materials show large first discharge capacities demonstrating their ability to react with lithium. Reversibility remains more challenging though possible for a few dozen cycles. The work has been extended to full-cell configuration by coupling metallic lithium with positive electrodes such as sulfur or titanium disulfide through complex hydride solid electrolytes. Beside pure LiBH4 which works only above 120 °C, various strategies like substitution, nanconfinement and sulfide addition have allowed to lower the working temperature around 50 °C. In addition, use of lithium closo-boranes has been attempted. These results break new research ground in the field of solid-state lithium batteries. Finally, operando and in-situ neutron scattering methods applied to full-cells are presented as powerful tools to investigate and understand the reaction mechanisms taking place in working batteries.

General information
State: Accepted/In press
Organisations: Department of Energy Conversion and Storage, Imaging and Structural Analysis, Universite Paris-Est, Institute for Energy Technology, Tohoku University, Utrecht University, University of Southern Denmark, Aarhus University
Number of pages: 13
Publication date: 2019
Peer-reviewed: Yes

Publication information
ISSN (Print): 0360-3199
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 4.1 SJR 1.116 SNIP 1.267
Web of Science (2017): Impact factor 4.229
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.74 SJR 1.145 SNIP 1.315
Web of Science (2016): Impact factor 3.582
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 3.46 SJR 1.27 SNIP 1.314
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 3.54 SJR 1.207 SNIP 1.484
Web of Science (2014): Impact factor 3.313
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 3.38 SJR 1.265 SNIP 1.449
Web of Science (2013): Impact factor 2.93
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.96 SJR 1.499 SNIP 1.708
Web of Science (2012): Impact factor 3.548
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes