

Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

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Item 3 (e) of the provisional agenda

Electric storage systems: miscellaneous

Comments on ST/SG/AC.10/C.3/2013/54: amendments regarding lithium batteries

Transmitted by the expert from Austria

- Useful explanations can be found in the following publication:
“Primäre und wiederaufladbare Lithium-Batterien
Script zum Praktikum Anorganisch-Chemische Technologie
TU Graz, Institut für Chemische Technologie Anorganischer Stoffe“

Download link:

<http://www.ak-tremel.chemie.uni-mainz.de/ChiuZ/Script%20TU%20Graz%20Lithium-Batterien.pdf>
- The most hazardous compound in a lithium metal battery is the lithium metal or alloy in a lithium metal (or alloy) battery. It will react with water and many other chemical substances.
- For the electrochemical reaction the Lithium (anode) will form a Lithium ion (Li⁺) and an electron (e⁻). On the other electrode (cathode) a reaction like LiCoO₂ and Li⁺ and e⁻ to Li₂CoO₂ will take place. In such a compound the Lithium is present as a lithium ion and is as harmless as in any other salt like LiCl. In a completely discharged battery the metal of the Anode is therefore totally consumed, the battery has no energy content and is therefore harmless.
- Therefore the text of 38.3.2.3 in the Manual of Tests and Criteria, fifth revised edition amendment 1 refers to the undischarged or fully charged state:

“Lithium content is applied to lithium metal and lithium alloy cells and batteries, and for a cell means the mass of lithium in the anode of a lithium metal or lithium alloy cell, which for a primary cell is measured when the cell is in an undischarged state and for a rechargeable cell is measured when the cell is fully charged.”
- If Lithium metal or alloy would be present also on the cathode this would mean the same material on both electrodes and therefore a zero voltage (see Fig. 1).

Conclusion: Lithium present as e.g. LiCoO₂ should not be considered in a risk based consideration.

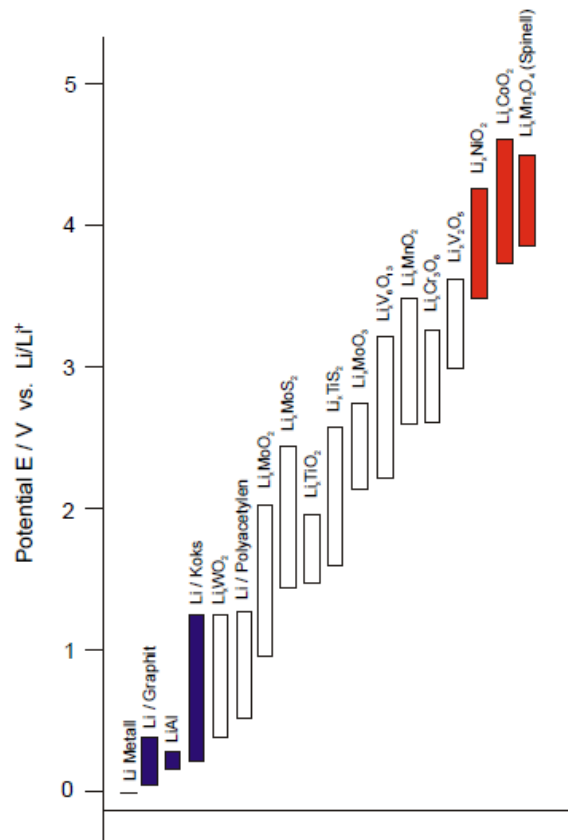


Figure 1

The figure shows some substances used as electrode materials in lithium batteries. Preferred are substances with low potential (left corner, bottom, blue) in combination with substances with high potential (right corner, top, red).