GTR EVS

'Electrolyte leakage and venting'

JRC Work Update

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Electrolyte leakage/venting verification - Current state of the art

"...visual inspection without disassembling any part of the Tested-Device" is adopted in Phase 1 as a method for verification of the occurrence of electrolyte leakage and venting.

JRC concerns:

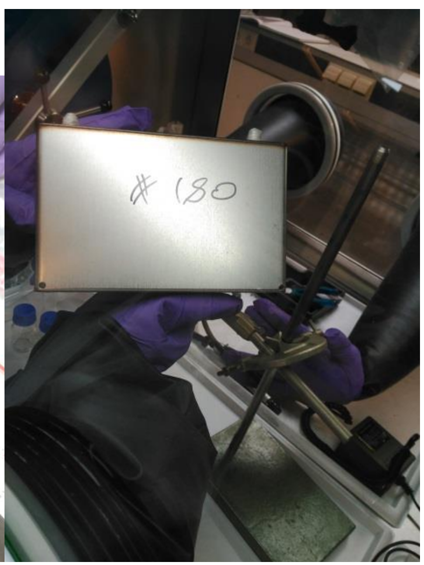
- due to high volatility of the electrolyte components and limited release volume, electrolyte leakage and venting may not always be easily detectable, while potentially creating toxic environment
- special measures may be required to ensure safety of inspecting personnel

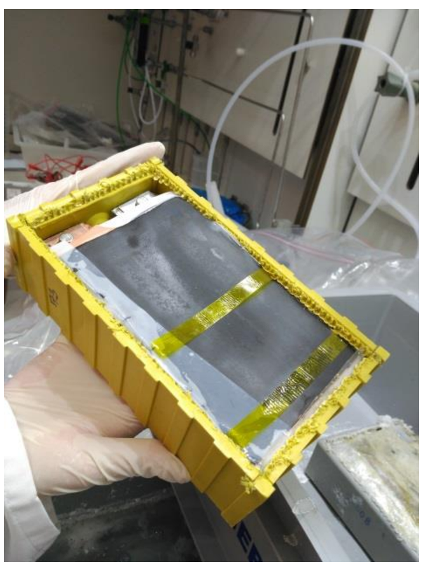
JRC work will focus on the development of more robust method(s) to first verify the occurrence of the electrolyte release and/or venting and, if possible, to quantify such release.

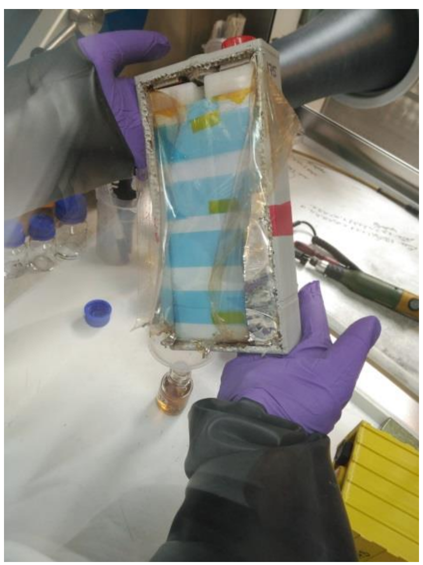
Ongoing Work - background

JRC has reported and is continuing research to quantify the amount of free liquid electrolyte in Li-ion battery (LIB) cells (continuation of research shown in EVS-07-24e.pdf):

- 9 large format prismatic cells from 3 different LIB cell manufacturers have been opened in 2017, including 1 cell aged in an electric vehicle, in addition to 4 cells analysed earlier.

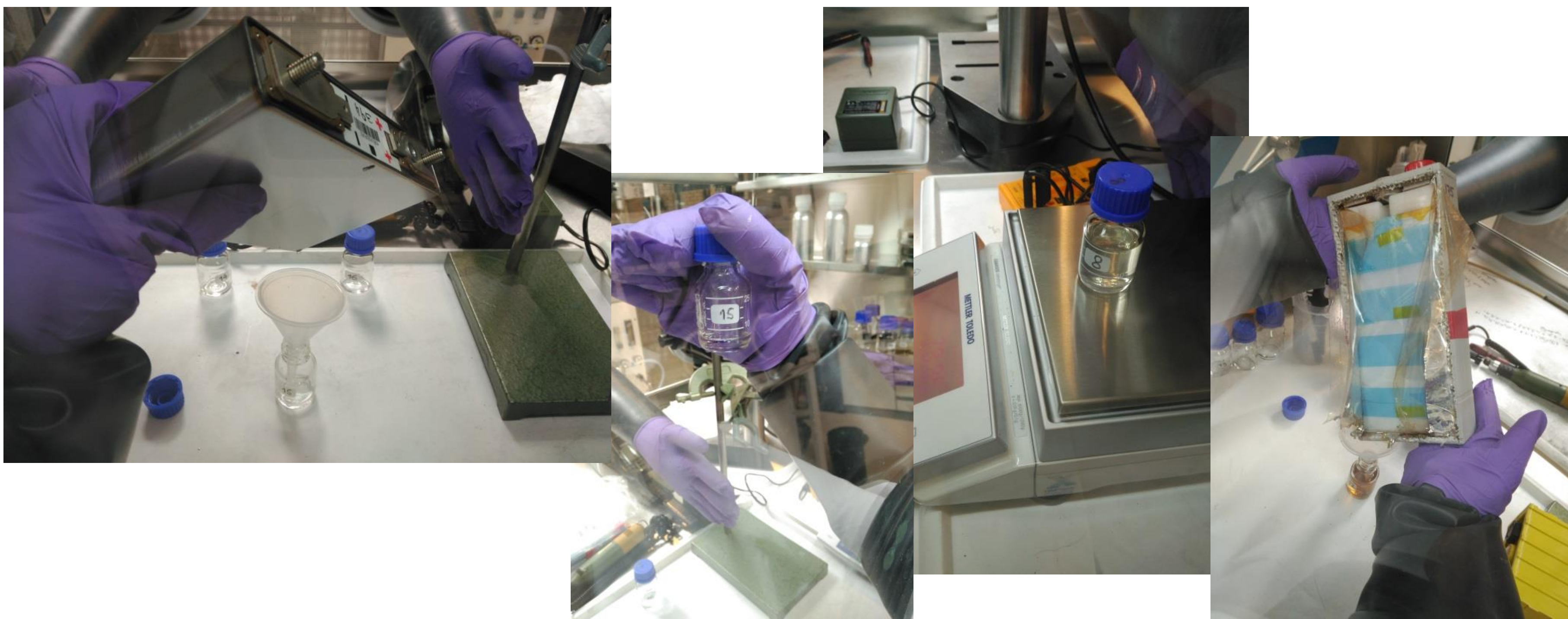






Ongoing Work - background

- All of the fresh cells contained free liquid electrolyte.
- Pouch as well as prismatic cells from 3 other LIB cells manufacturers will be opened and analysed in the near future.



Objective

Method development for detection and quantification of potentially toxic release associated with electrolyte leakage and venting

The aim is to develop a robust and practical method, suitable for use within regulatory environment, for detection and quantification of the emissions from traction batteries upon electrolyte leakage and/or venting that delivers reproducible and repeatable results.

Ongoing Work

Step 1
[Q2 2017]

Defining the project scope

Identifying the requirements for the method(s) to be developed:

- compounds to be identified,
- typical concentration range per compound,
- measurement type (point or wide area monitoring) and location (in the vehicle cabin, outside the vehicle cabin, at what distance from a vehicle etc.),
- required accuracy, precision, limits of detection and quantification of the method(s).

Ongoing Work

Step 2 *[Q2 2017]*	**Review available analytical methods and existing published methods** e.g. remote sensing using FTIR spectroscopy, LIDAR, gas sensors, detector tubes, fluorometric analysis etc.
	Evaluate their suitability for this project. Information sources to be consulted: - scientific literature, - internet, - external peers, - equipment suppliers, - testing bodies

Ongoing Work

Step 3 *[Q3 2017]*	**Select analytical method(s)** for further development based on combined outputs of Steps 1 and 2
Step 4 *[Q4 2017]*	**Procure and commission equipment** necessary for the development of the method(s) selected in Step 3

Future Work

Step 5
[2018]

Tests with individual model compounds

Tests are performed using individual model compounds

- solvents e.g. DMC, DEC, EC, etc.
- salt decomposition products e.g. HF, Li^+, etc.

Step 6
[2018]

Tests with model mixtures

Tests are performed using model mixtures, whereby method specificity is evaluated.

Future Work

Step 7
[2019]

Tests with real-world mixtures in an enclosed environment
Method robustness, repeatability, accuracy, precision, specificity, limits of detection and quantification, linearity and range are determined.

Step 8
[2019]

Tests with real-world mixtures in open air environment
Method robustness, repeatability, accuracy, precision, specificity, limits of detection and quantification, linearity and range are determined.

Throughout the work, collaboration with external parties will be sought, whenever deemed necessary to complement the expertise and knowledge of JRC.