SAFETY GALA ALBANIA

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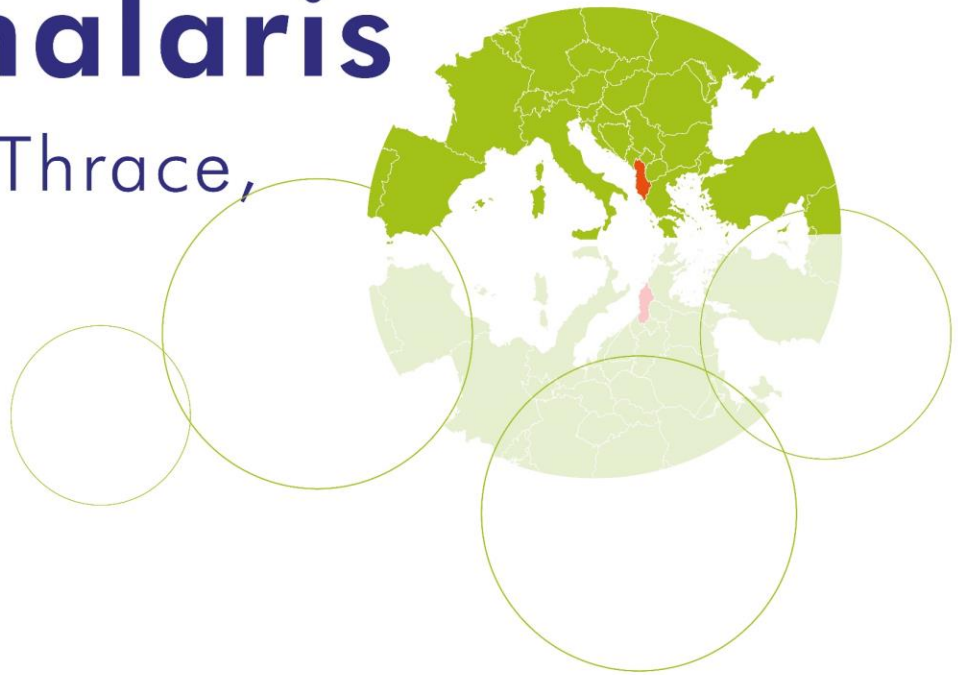

Assessing Smart Extinguishing Materials for Containing Li-ion Battery Fires

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SAFETY GALA ALBANIA
Visioning the future: Human Dimension, Safety and Technology
14 November 2024

Introduction
What about EV fire spread in carparks?

Mitigation effort

15:25

Car starts burning

0 min

15:33

Alarm centre receivces alarm

8min 39sec

15:34

Fire service dipatched

9min 29sec

15:36-37

First fire trucks leave stations

11min 23sec
12 min 7sec

15:37

Manual alarm button activated in the parking building. Alarmbells activated

12min 50sec

15:44,48

First 2 trucks from fire service are in place

19-22min

Response time appr. 10-11 min

15:34

Aiport control centre receives call from Heliport

15:35

Airport fire and accident service dispatched

9-10 min

15:36

Vehicle type identified: Opel Zafira

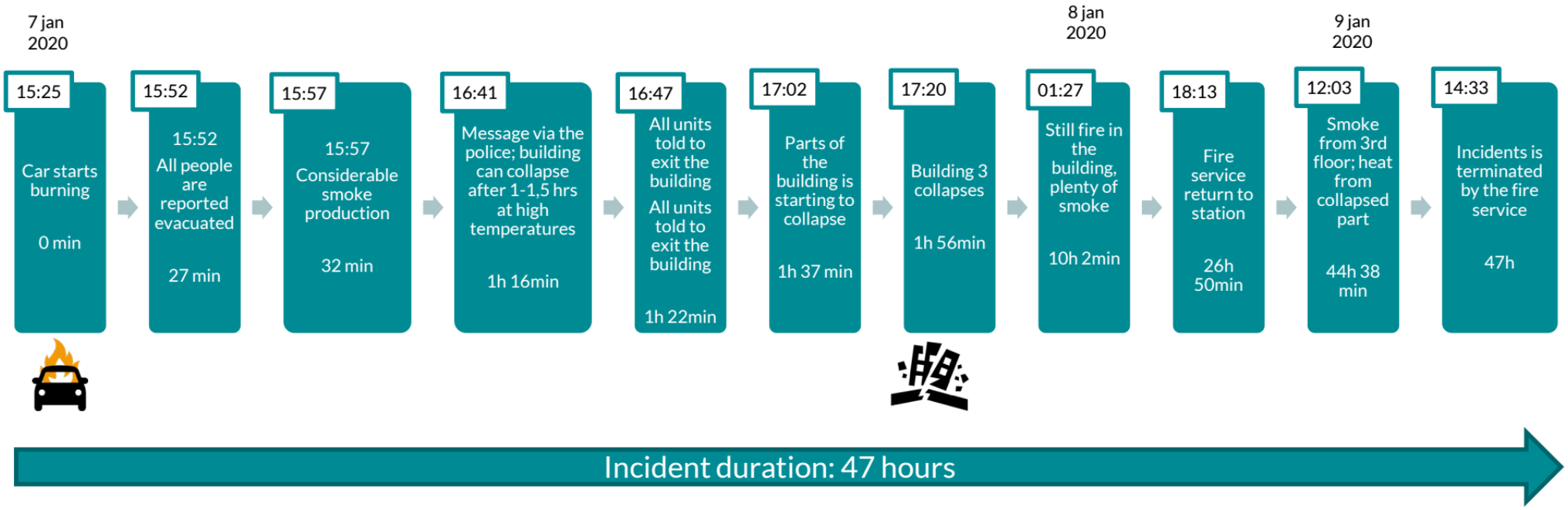
10min 57sec

15:44

Airport fire truck in place,

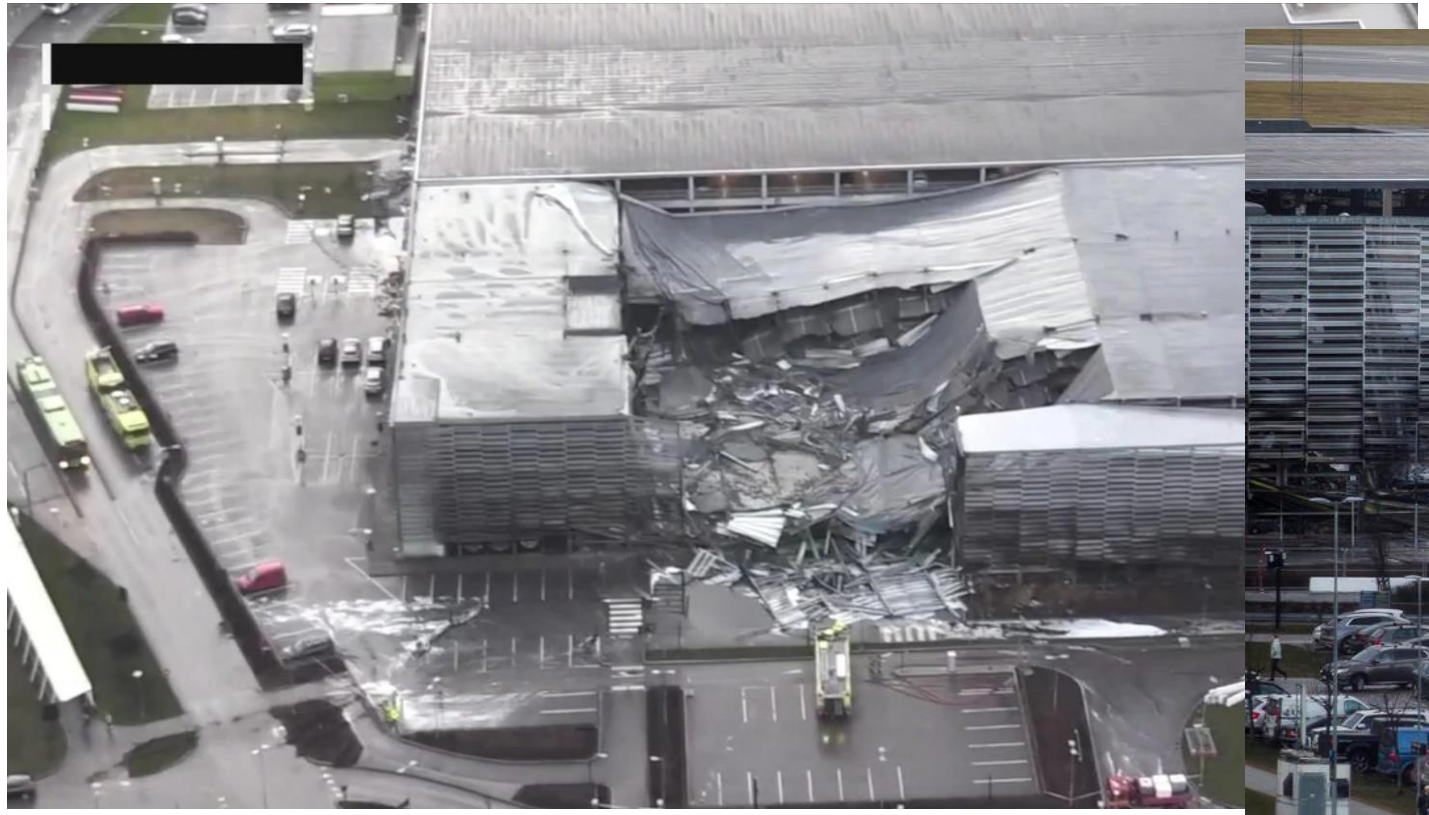
19 min

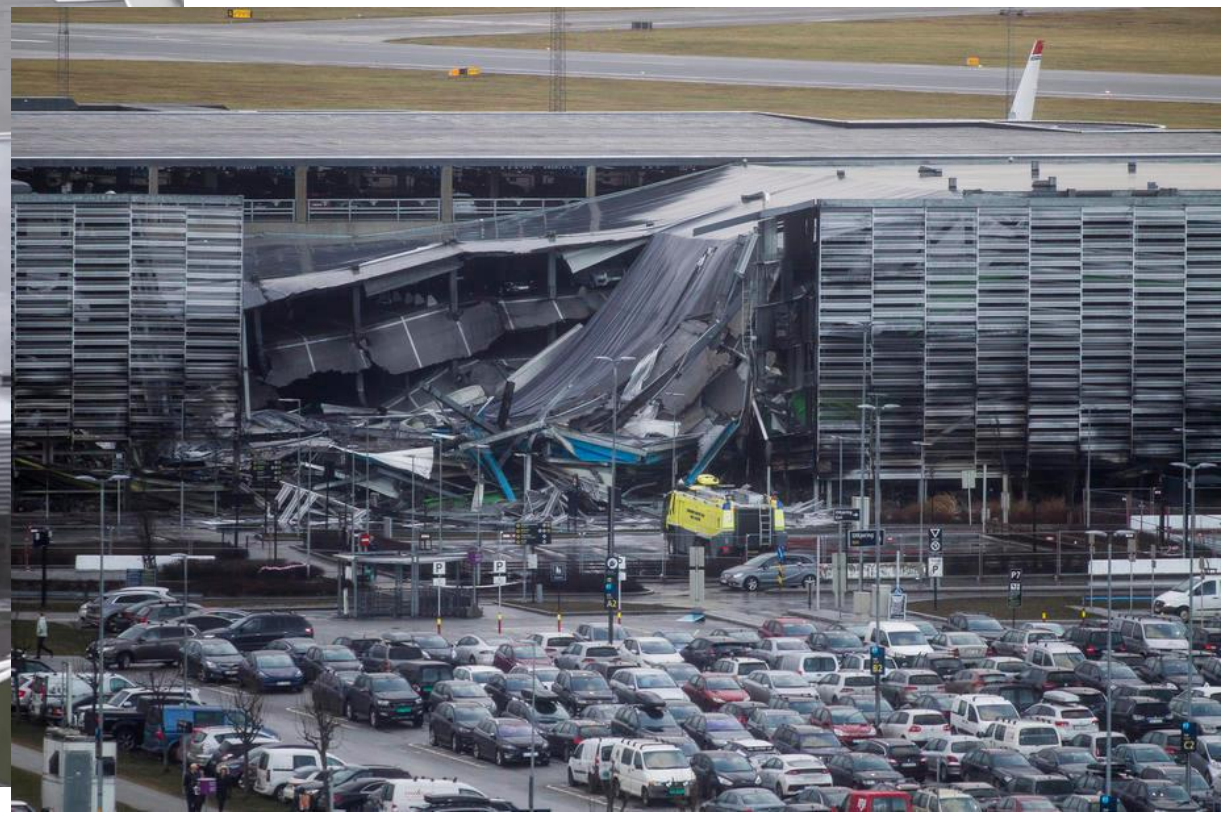
Mitigation effort



Wind: 11 – 19 m/s wind during fire.

Introduction
What about EV fire spread in carparks?





AVD (Aqueous Vermiculite Dispersion)

- AVD is an aqueous dispersion of chemically exfoliated vermiculite. It is applied to lithium battery fires as a mist, extinguishing them and preventing the propagation of the fire.
- **Vermiculite** is the name given to a group of hydrated laminar aluminium-iron-magnesium silicates.
- It consists of thin, flat flakes containing microscopic layers of water.
- The chemical exfoliation of vermiculite produces microscopic, individual platelets that are freely suspended in water.
- This yields a stable aqueous dispersion of vermiculite to be used as a lithium battery fire extinguishing agent.

https://www.avdfire.com/what-is-aqueous-vermiculite-dispersion/

Hydrogel

This fire extinguishing solution consists of a modified natural clay and water, components which are derived from nature.

With this patented, new approach, no Fluorine-polymer chemistry is necessary.

Hydrogel does not contain any PFAS and its carbon footprint is less than 0,7% and is not dangerous for the environment and humans according to the most stringent European chemical laws.

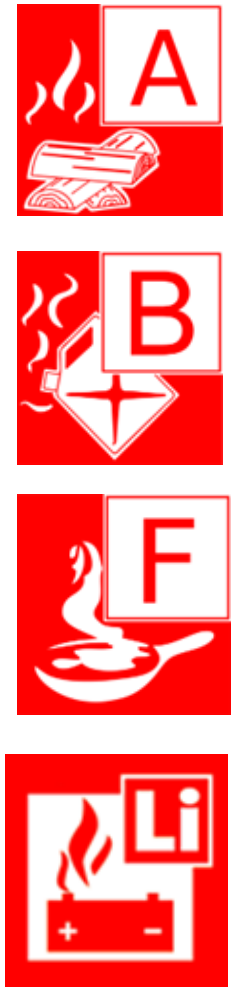
https://anogas.com/hydrogel/

EMME FOAM

According to tests executed with this fire extinguisher, it's possible to stop the combustion of a lithium-ion battery with a water-based fire extinguisher with foam additives.

It has been verified that the use of the fire extinguisher allows for lower temperature and control of any re-ignitions of the cells present inside the battery (generated by the chain reaction of the same and due to their shape inside the battery pack).

Bonpet liquid



Bonpet liquid is a water solution of inorganic salts and organic compounds.

- Ammonium carbonate CH_2O_3-xH_3N
- Ammonium hydrogen carbonate CH_2O_3-H_3N
- Towalex AFFF 3% UL

Compounds of the extinguishing liquid are also used in the food industry

Bonpet Systems Slovenia for Bonept Liquid https://www.bonpet.si/en_US/bonpet-tekocina
Life Solutions Greece for Bonept Liquid https://www.bonpetsystems.gr/liquid-en/
https://www.youtube.com/channel/UCUZLqhaUpM2as6WbYCERC6Q/videos

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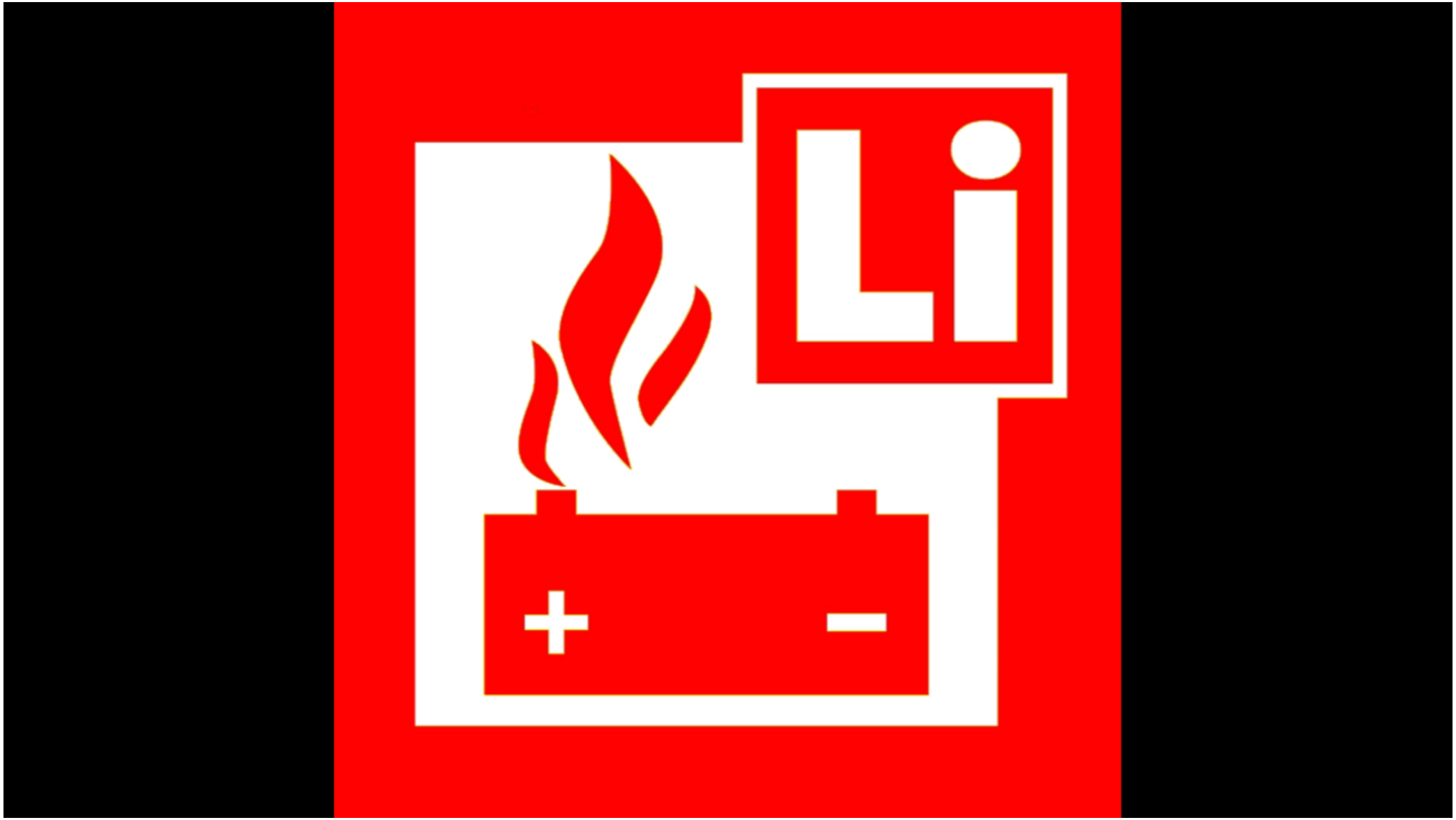

Comparative Analysis

Exting. Agent	AVD	HYDROGEL	EME FOAM	BONPET
EN2 Fire Type	A	A - F	A - B - F	A - B - F
Ext. Fill Volume / Liters	6 lt	9 lt	6 lt	6 lt
EN3 Fire Ratings	13A	13A	27A - 233B - 40F	27A - 144B - 75F
EN3 Dielectric up to 1000V	Yes	Yes	Yes	Yes
Li-Ion Battery Voltage	16.8 V	30 V	36 V	400 V
Li-Ion Battery (W/h)	120 Wh	600 Wh	750 Wh	20000 Wh
LiFePO4 Battery (W/h)	NO	NO	NO	500 Wh / 200ml

Interdisciplinary – Interthematic Postgraduate Studies Programme

"Chemical Industry: Quality, Environment, Health and Safety Management"

(MSc in Quality, Safety, Security, Health and Environmental Management)

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Democritus University of Thrace

MSc in Quality, Safety, Security, Health and Environmental Management

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