LI-ION TAMER GAS LIST APPLICATION NOTE

This application note provides a list of common gases and compounds emitted by lithium-ion batteries to which the Li-ion Tamer sensor is sensitive.

Li-ion Tamer Sensors

Honeywell

BACKGROUND

The Li-ion Tamer sensors are designed to be sensitive to Volatile Organic Compounds (VOCs), and more broadly, reducing gases. These compounds are shown to be most prevalent during the initial cell venting stage of lithium-ion battery abuse and failure. During the initial cell venting, or off-gas event, they primarily take the form of battery electrolyte solvent vapours, such as diethyl carbonate, dimethyl carbonate, and ethylene carbonate.

The subsequent thermal runaway event is also high in VOCs and reducing gases, such as flammable hydrocarbons, carbon monoxide, and hydrogen. This allows Li-ion Tamer to respond to thermal runaway gas generation as well.

While VOCs are ideal gases to target for detection of lithium-ion battery gas release events, they can also be commonly found in industrial and commercial environments. Therefore, Li-ion Tamer is designed with a proprietary algorithm to help prevent false alarms due to drift in ambient VOC concentrations, and instead it will respond to abrupt exposures of target gases, such as a puff of gas or a venting cell.

SENSITIVE GASES LIST

The following is a list of common gases/compounds emitted by lithium-ion batteries that Li-ion Tamer is sensitive to:

- Battery electrolyte solvent vapours:
  - Diethyl carbonate (DEC)
  - Dimethyl carbonate (DMC)
  - Ethylene carbonate (EC)
  - Ethyl methyl carbonate (EMC)
  - Vinylene carbonate (VC)
  - Propylene carbonate (PC
  - Methyl butyrate
- Hydrogen (H_2)
- Carbon monoxide (CO)
- Flammable hydrocarbons, including:
  - Acetylene (C_2H_2)
  - Ethylene (C_2H_4)
  - Ethane (C_2H_6)
  - Methane (CH_4)
  - Hexane (C_6H_{14})
  - Butane (C_4H_{10})
  - Cyclopropane (C_3H_6)
  - Propane (C_3H_8)

The following is a list of common gases/compounds that may be found in industrial and commercial environments that Li-ion Tamer is sensitive to, and should be avoided to prevent nuisance alarms:

- Cleaning agents
  - sopropyl alcohol (IPA)
  - Acetone
  - Etc.
- Aerosols
  - Air fresheners
  - Air duster
  - Etc.
- Diesel/gasoline exhaust
  - Benzene (C_6H_6)
  - Carbon monoxide (CO)
  - Etc.
- Paints and varnishes (when newly applied)
- Adhesives and caulks (when curing)
  - Epoxy
  - Resin
  - Etc.
- Welding/soldering fumes
- Smoking or other burning fumes

Note: *These lists are intended to provide guidance on the gases and compounds that Li-ion Tamer is sensitive to, and are not complete lists of all VOCs.*

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