Self discharge of batteries

INTRODUCTION

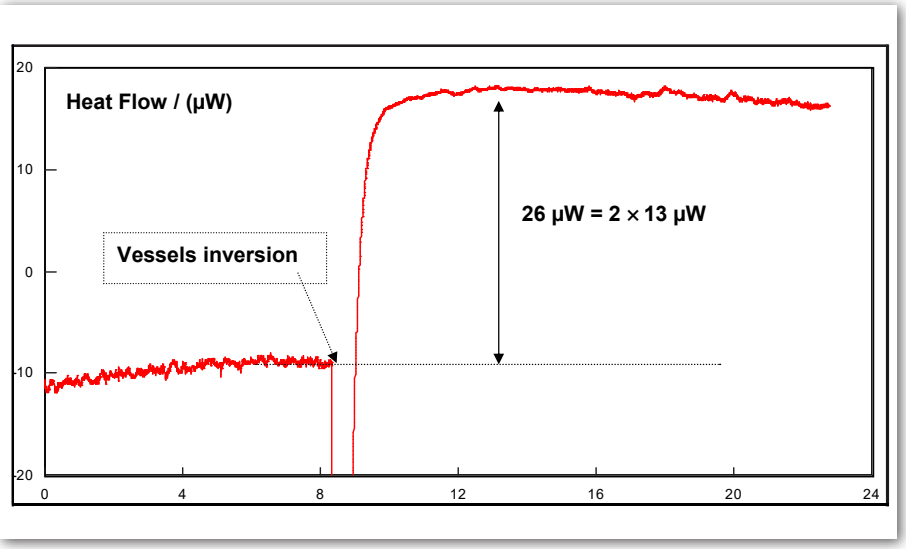
Self-discharge is a phenomenon in batteries in which internal chemical reactions reduce the stored charge of the battery even if the battery isn't used. Measurement of the heat flow of a battery during its self-discharge thus helps at comparing its capacity to stay charged during long periods of time against various other batteries. The method of measurement of self-discharge heat using an isothermal calorimeter consists at placing a sample holder containing a battery in the reference side of the calorimeter where the self-discharge heat is produced. The two sample holders are swapped and the difference of calorimetric signal level before and after swapping is exploited to determine the self-discharge heat.

EXPERIMENT

- Vessel: Standard vessel made of stainless steel.
- Sample : 6 watch batteries of Li-I type. Available space for the sample inside the vessel :

- diameter : 32.7 mm
- height : 111.2 mm
- volume : 93.3 ml

- Method : Isotherm at 27.4°C during 24 hours.



RESULTS AND CONCLUSION

- During the first 8 hours, the CALVET LV monitors the heat flow dissipated by the batteries. After this time, the two vessels (measure and reference) are swapped. After another 4 hours the heat flow is stable again.
- The deviation of heat flow before, and after swapping (26 µW) is twice as high as the heat flow dissipated by the 6 batteries : 13µW (= 26 µW / 2)
- Each battery dissipates an average heat flow of 2.2 µW (=13 µW / 6).

INSTRUMENT

CALVET LV

20 to 200°C

HIGHEST HEAT MEASUREMENT ACCURACY
3D sensor with Joule effect calibration.

MODIFIABLE TEMPERATURE CONDITIONS for increased flexibility and replication of real life conditions.

CONVENIENT INTERCHANGEABLE CELLS to perform multiple experiments in one instrument: mixing, high pressure and high vacuum, pressure control and measurement, gas flow, interactions between solids, liquids and gases.

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