

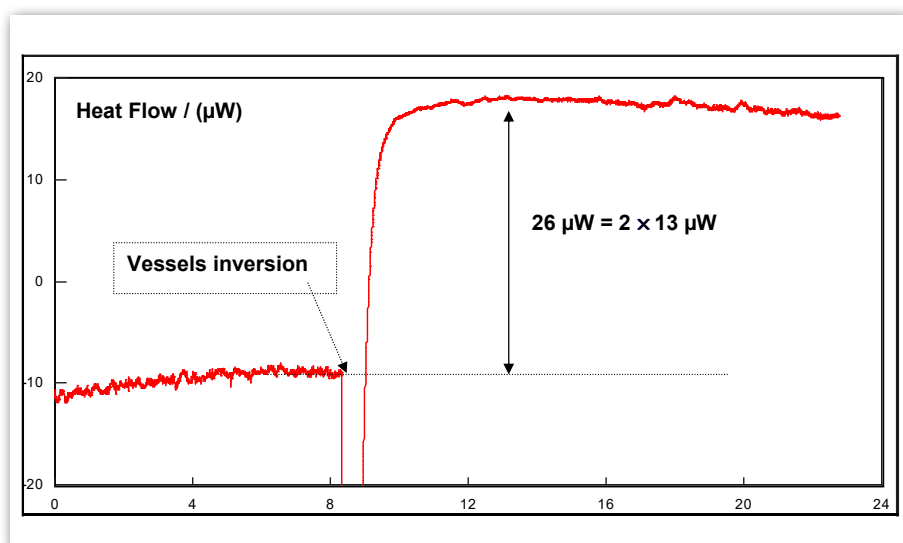
Self discharge of batteries

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 ($26 \mu\text{W}$) is twice as high as the heat flow dissipated by the 6 batteries : $13 \mu\text{W} (= 26 \mu\text{W} / 2)$
- Each battery dissipates an average heat flow of $2.2 \mu\text{W} (= 13 \mu\text{W} / 6)$.

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.