Equations for Python Team

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Q_{JH} = Joules Heat
t_{res} = pulse duration of triangle heat pulse
rr = ramping rate
I_{cc} = Compliance Current
C = Minimum voltage when device can switch on
V_{res} = Voltage that Reset operation occurs at

$$Q_{JH} = \frac{V_{res}^3 \cdot I_{cc}}{3 \cdot RR \cdot C} \Rightarrow \frac{V_{res}^3 \cdot I_{cc}}{3 \cdot RR \cdot C} = mc\Delta T$$

$Q = m c_s \Delta T$
m = mass $= V \times \rho_m$
ρ_m = Mass density
V = Volume of electrode
C_s = Specific Heat capacity of material

Degradation metric

$$DEG = \frac{M_x(\text{Unstressed}) - M_x(\text{preheated})}{M_x(\text{unstressed})}$$

M_x = Maximum Number of switching cycles of a given cell

↳ Average $M_x(\text{Unstressed}) \gtrsim 13$

Q_{st} = Portion of heat acommodated in body
f_{loss} = fraction of heat present in material after losses to environment
Q_{Nst} = Remnant Heat
f_{diss} = Portion of heat dissapated to cooling off
N = # of times switched On+off

$$Q_{Nst} = N \cdot Q_{st} \cdot f_{diss} = N \cdot Q_{JH} \times f_{loss} \times f_{diss} = C_s m \Delta T$$

$$\hookrightarrow \frac{\partial T}{\partial t} = K_{Th} \frac{\partial^2 T}{\partial t} + \frac{g}{C_s \rho_m}$$

g = heat produced
ρ_m = mass density
K_{Th} = thermal diffusivity
C_s = Specific heat capacity
T = Temperature
t = time

D (Distance) $= \sqrt{K_{Th} \times t_{tr}}$ → See how long it takes heat to travel a distance

t_{tr} = Transit time