GITT

Li-ion1Li-ion

Li-ion
GITT[1,2]

GITT

GITTiRRRuRctLi-ioniR(i.e., when / 0) OCP100

iRiRdE/dt = 0OCP100
1-3

$$D = \frac{4}{\pi}\left(\frac{iV_m}{z_A F S}\right)^2 \left[\left(dE/d\delta\right)\Big/\left(dE/d\sqrt{t}\right)\right]^2 \qquad (1)$$

i (A)Vm (cm3/mol)zAF(96485C/mol) S (cm2)dE/dE (V)dE/dtt (s)E (V)
1NOVAEt [4]

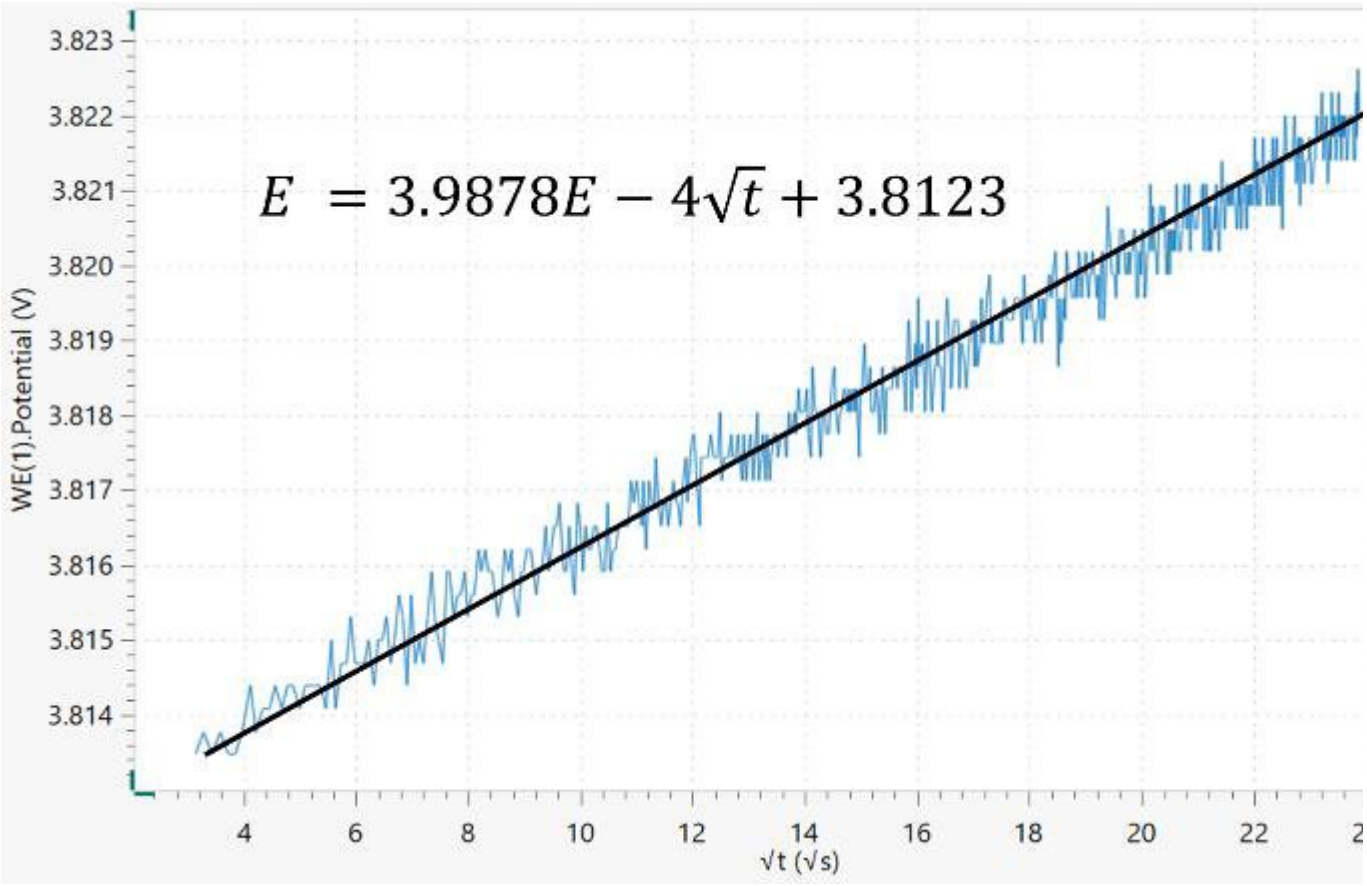


Figure 1. Potential vs. t plot. In addition, the linear regression line and its equation are shown.

dE/dt (1)

$$D = \frac{4}{\pi\tau}\left(\frac{n_m V_m}{S}\right)^2 \left(\frac{\Delta E_s}{\Delta E_t}\right)^2 \qquad (2)$$

(s)nm(mol)Vm(cm^3/mol)S(cm^2)Es(V)Et(V)iR

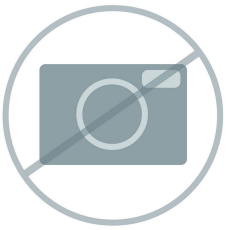
Autolab PGSTAT302NEnix Energies3.75 V8.25 Wh2.2 AhLi-ion

AUT302N.S - Autolab PGSTAT302N

This high end, high current potentiostat/galvanostat, with a compliance voltage of 30 V and a bandwidth of 1 MHz, combined with our FRA32M module, is specially designed for electrochemical impedance spectroscopy.The PGSTAT302N is the successor of the popular PGSTAT30. The maximum current is 2 A, the current range can be extended to 20 A with the BOOSTER20A, the current resolution is 30 fA at a current range of 10 nA.

AUT.COIN2.HLD.S - Autolab DuoCoin Cell Holder

The Autolab DuoCoin Cell Holder has 4-point Kelvin gold-plated contacts to assure the highest precision measurements for your battery research. A versatile accessory that can accommodate all standard cells sizes with capacity for smaller and larger non-standard cells and two cells can be processed at one time.Autolab DuoCoin Cell Holder gold plated contacts and gold plated PCB provide protection from corrosion and damage to the accessory in your busy laboratory.Experimental set up is simplified with the Autolab DuoCoin Cell Holder with visible electrode labels and cable connections that correspond to the Autolab potentionstat/galvanostat cable colors. Autolab’s attention to detail is reflected in the silicon surface grippers on the bottom of the Autolab DuoCoin Cell Holder to provide stability in a complex experiment set up.



NOVA - Advanced software for electrochemical research

NOVA is the package designed to control all the Autolab instruments with USB interface.Designed by electrochemists for electrochemists and integrating over two decades of user experience and the latest .NET software technology, NOVA brings more power and more flexibility to your Autolab potentiostat/galvanostat.NOVA offers the following unique features:Powerful and flexible procedure editor; Clear overview of relevant real-time data; Powerful data analysis and plotting tools; Integrated control for external devices like Metrohm Liquid Handling devices;

AUT204.S - Autolab PGSTAT204

The PGSTAT204 combines the small footprint with a modular design. The instrument includes a base potentiostat/galvanostat with a compliance voltage of 20 V and a maximum current of 400 mA or 10 A in combination with the BOOSTER10A. The potentiostat can be expanded at any time with one additional module, for example the FRA32M electrochemical impedance spectroscopy (EIS) module.The PGSTAT204 is an affordable instrument which can be located anywhere in the lab. Analog and digital inputs/outputs are available to control Autolab accessories and external devices are available. The PGSTAT204 includes a built-in analog integrator. In combination with the powerful NOVA software it can be used for most of the standard electrochemical techniques.

NOVA

NOVA GITT1010OCP4.2 VGITT1010CC/10CC/1010C/10220 mA-220 mA

2GITTOCP = 3.62VGITT4.2V2.8 V

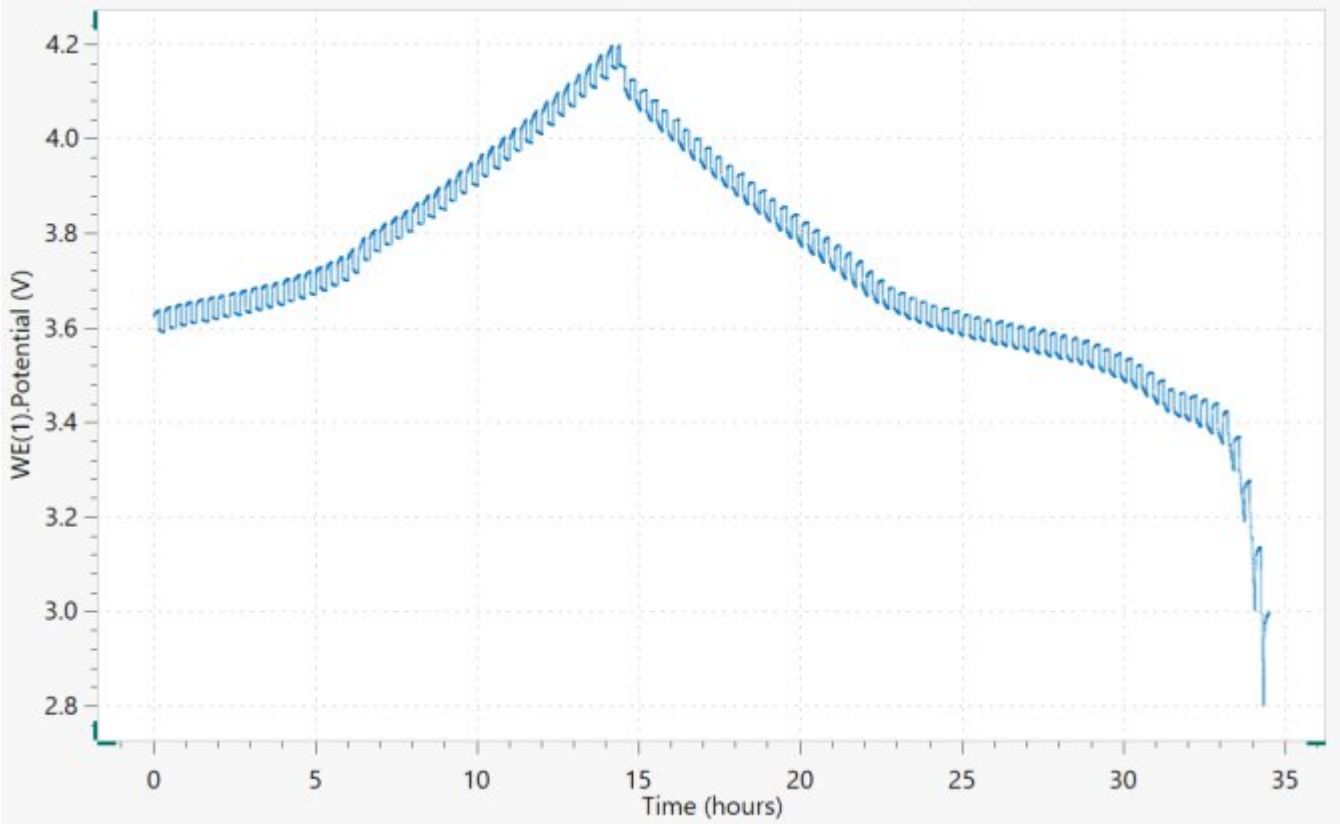


Figure 2. Galvanostatic intermittent titration curve vs. time The duration of the charge and discharge pulses have been calculated based on a C/10 current rate.

GITT32

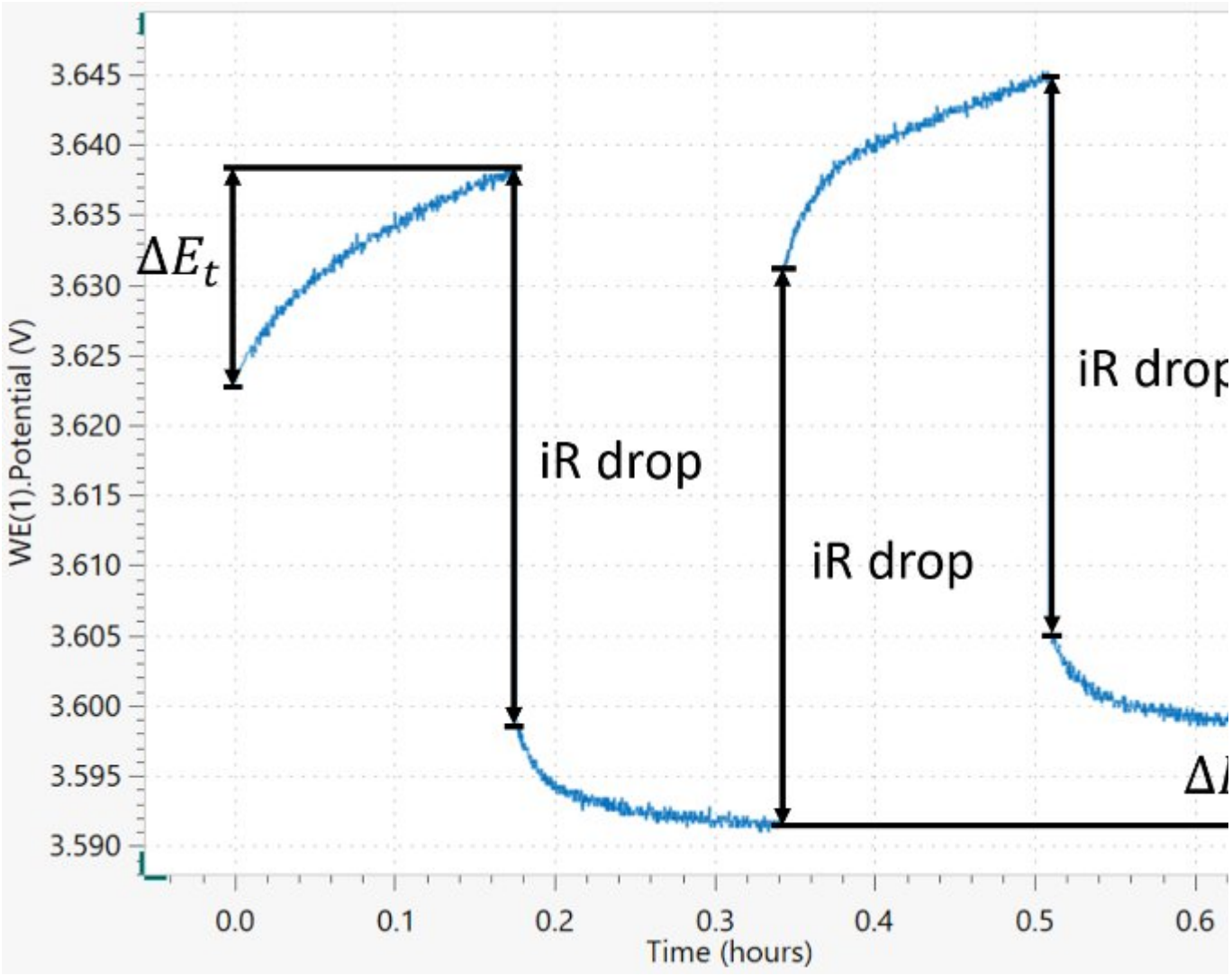


Figure 3. First two charge steps, each composed by 10 minutes of C/10 galvanostatic charge, followed by 10 minutes of relaxation time. The iR drop is shown, together with the and .

dE/d dE/d (2) Et10iRiR10iREt

Li-ion (1) (2) VmS
GITT
dEd log(D/cm2s-1)VV

AUTOLABNOVALiionGITT vs.

1. C.J. Wen, B.A. Boukamp and R.A. Huggins, J. Electrochem. Soc. Vol. 126, No. 12, 2258 (1979);
2. W. Weppner and R.A. Huggins, J. Electrochem. Soc. Vol. 124, No. 10, 1569, (1977);
3. Y. Zhu and C. Wang, J. Phys. Chem. Vol. 114, No. 6, 2830, (2010);
4. Z. Shen, L. Cao, C.D. Rahn and C.-Y. Wang, J. Electrochem. Soc. Vol. 160, No. 10, A1842, (2013)