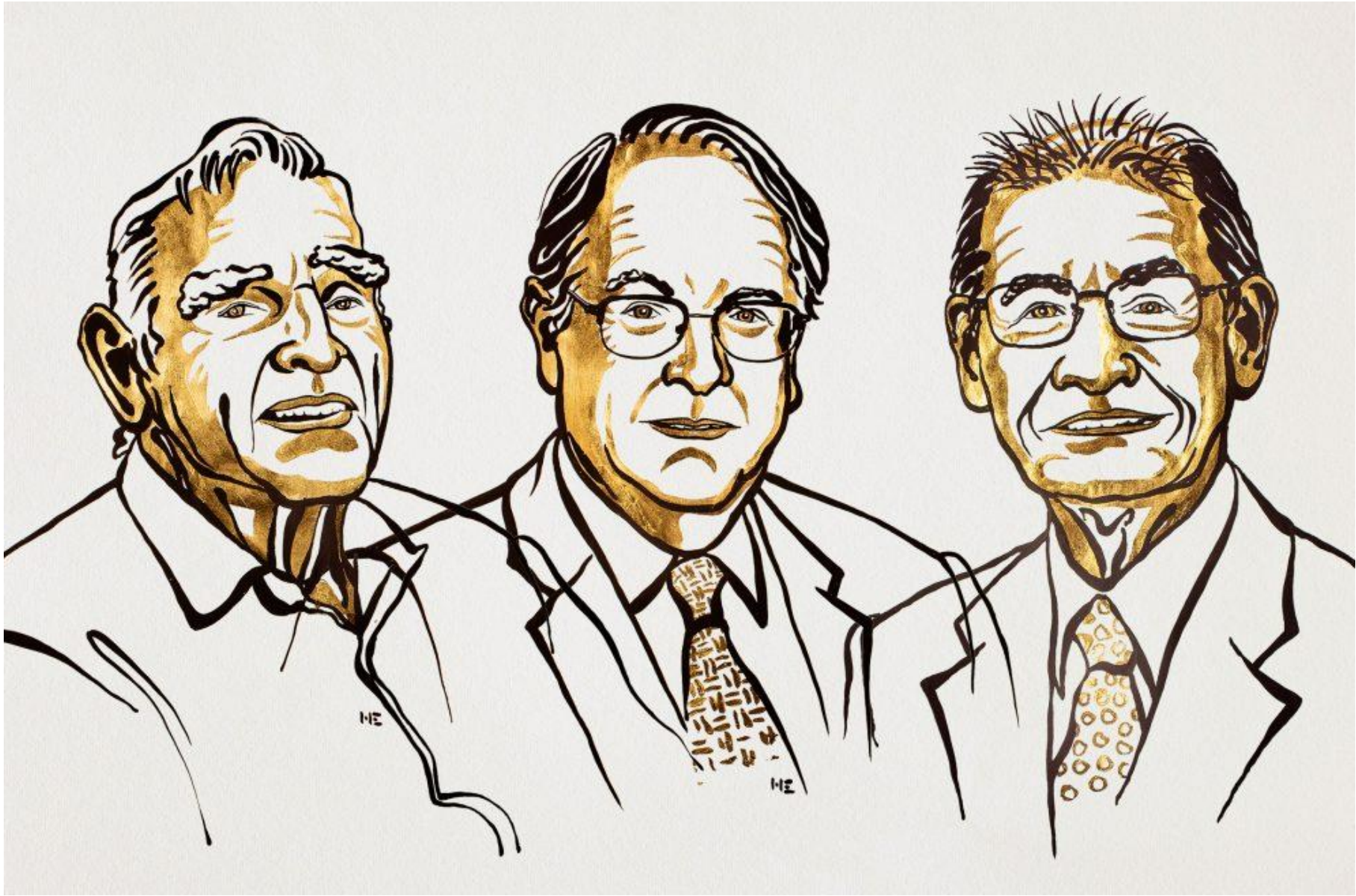


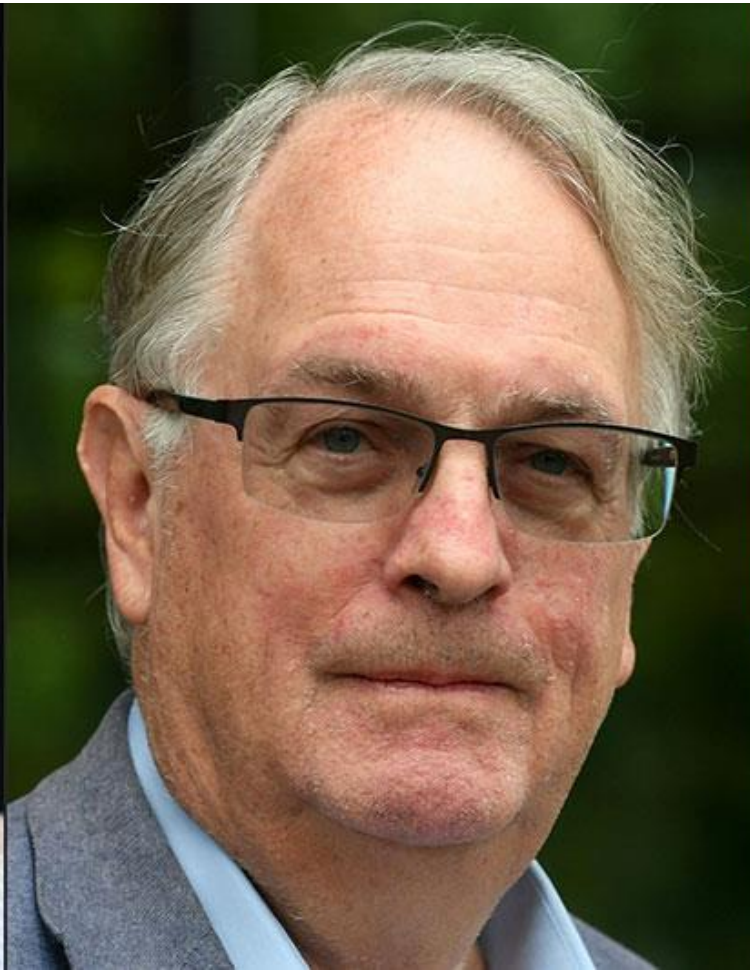
Lithium Ion batteries

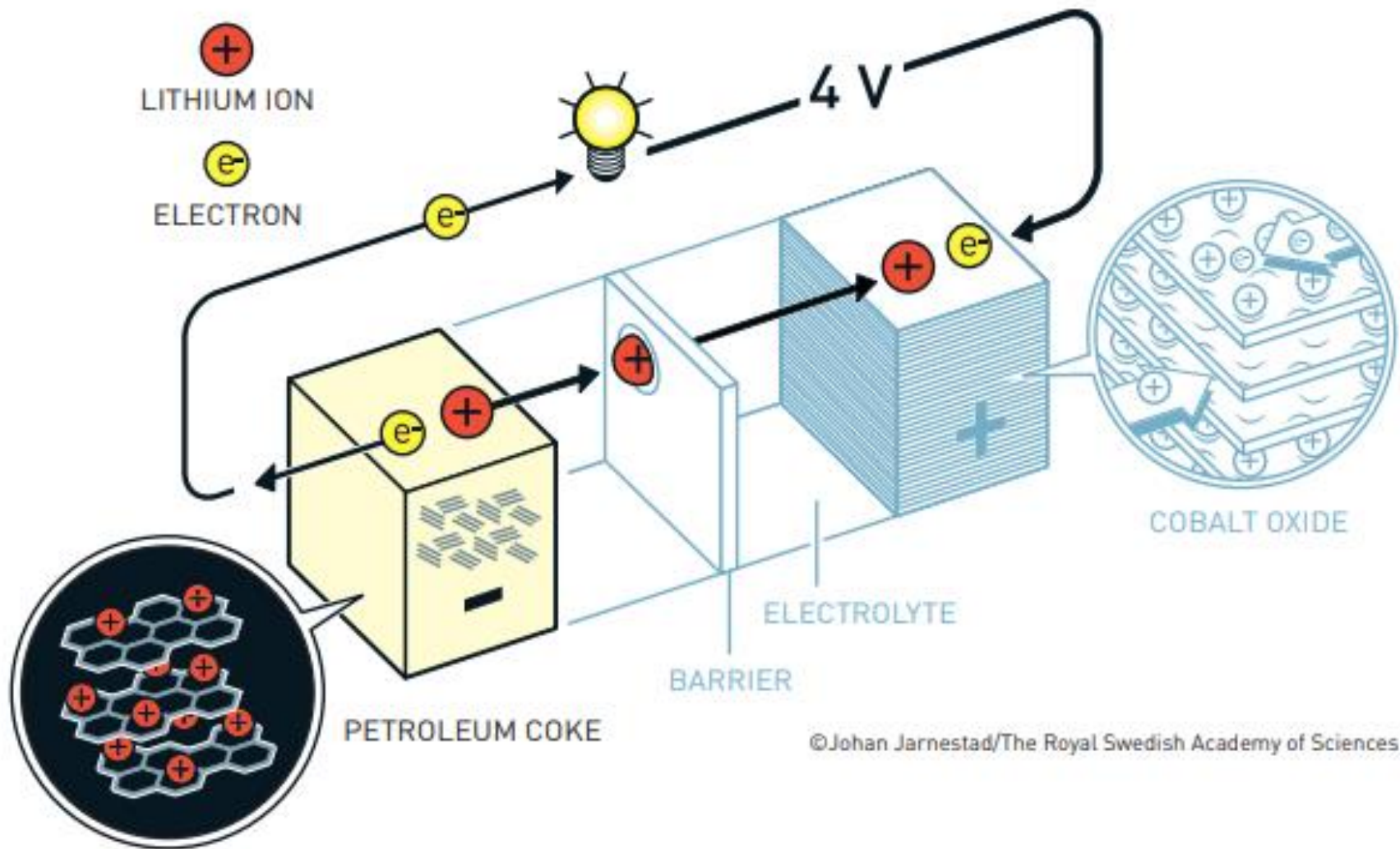
Nobel prize Chemistry 2019

Fraser Hughson

Supervisors: Thomas Nann, Jim Johnston



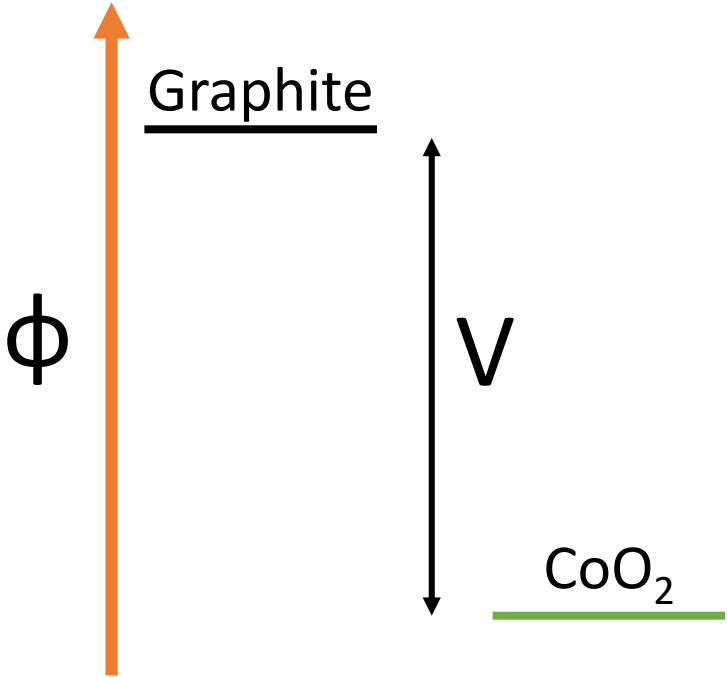
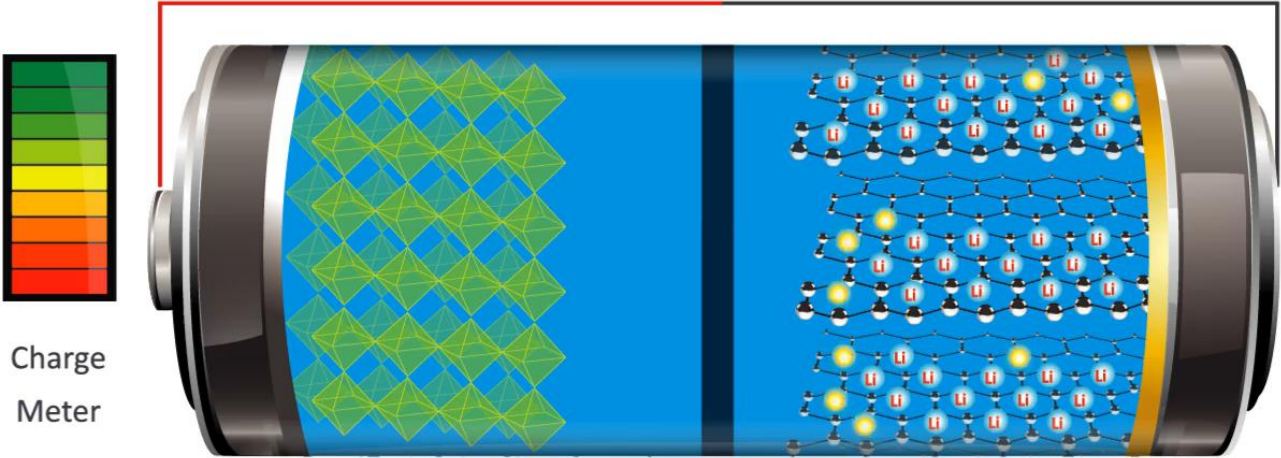




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How Lithium-ion Batteries Work

Discharge



$$\text{Energy} = \text{Capacity} \times \text{Voltage}$$

How much charge
you can store

What energy you
can store the
charges at

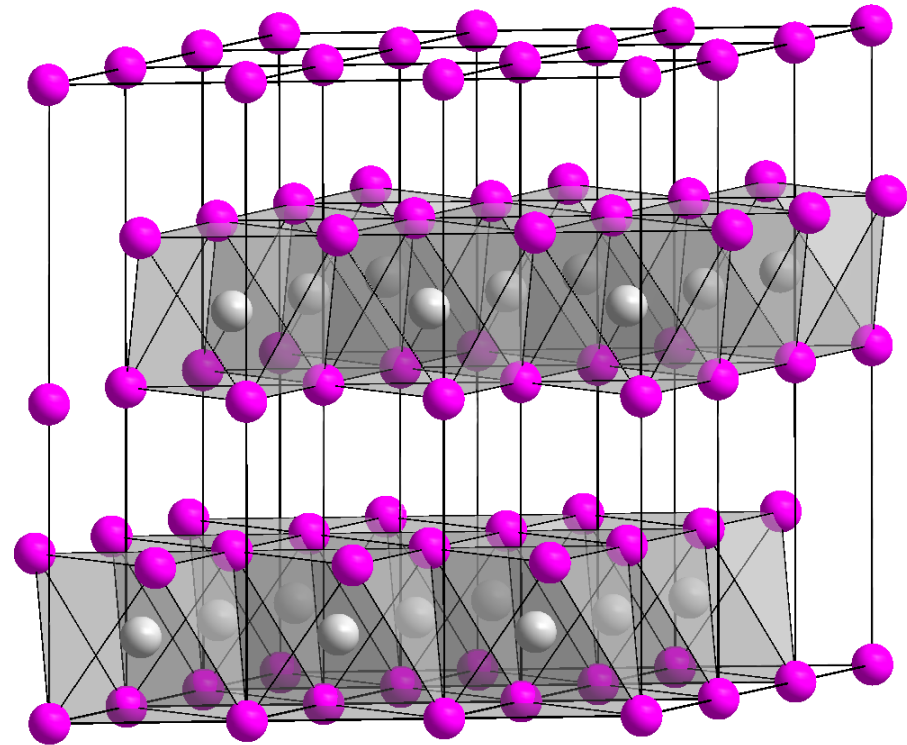
A story in three parts

Part 1 – Proof of concept

- Whittingham @ Exxon
- Oil crisis

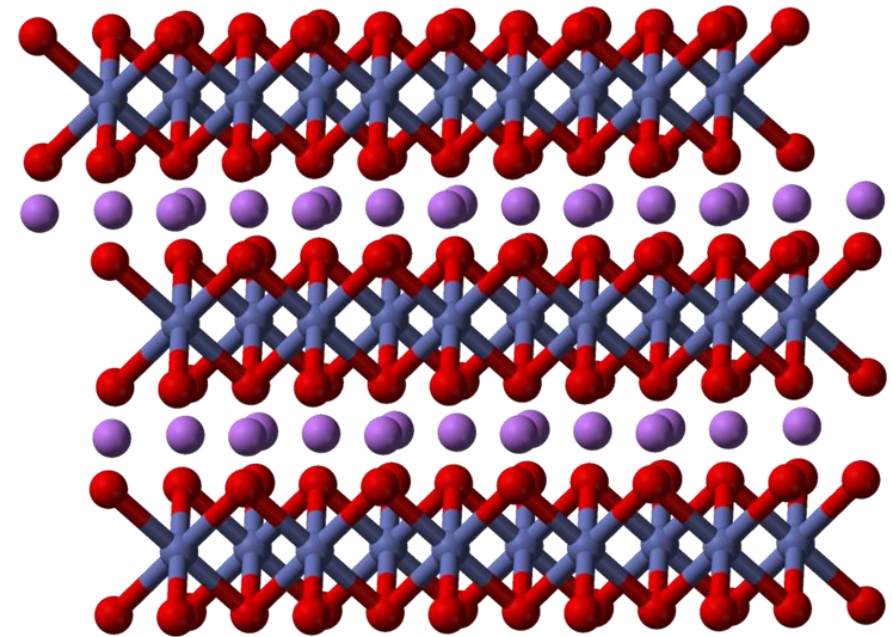
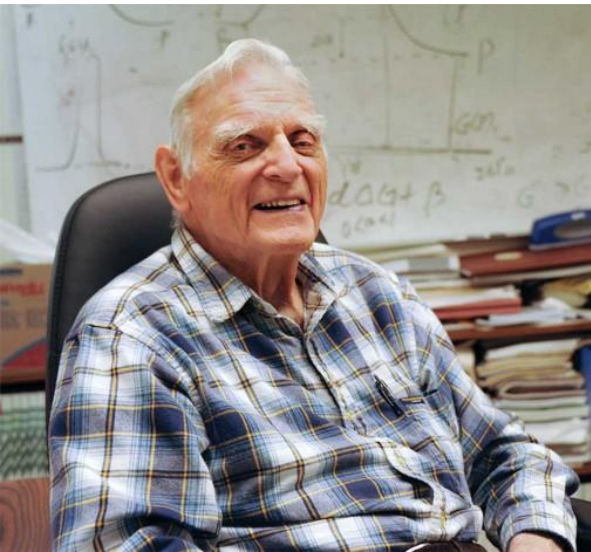


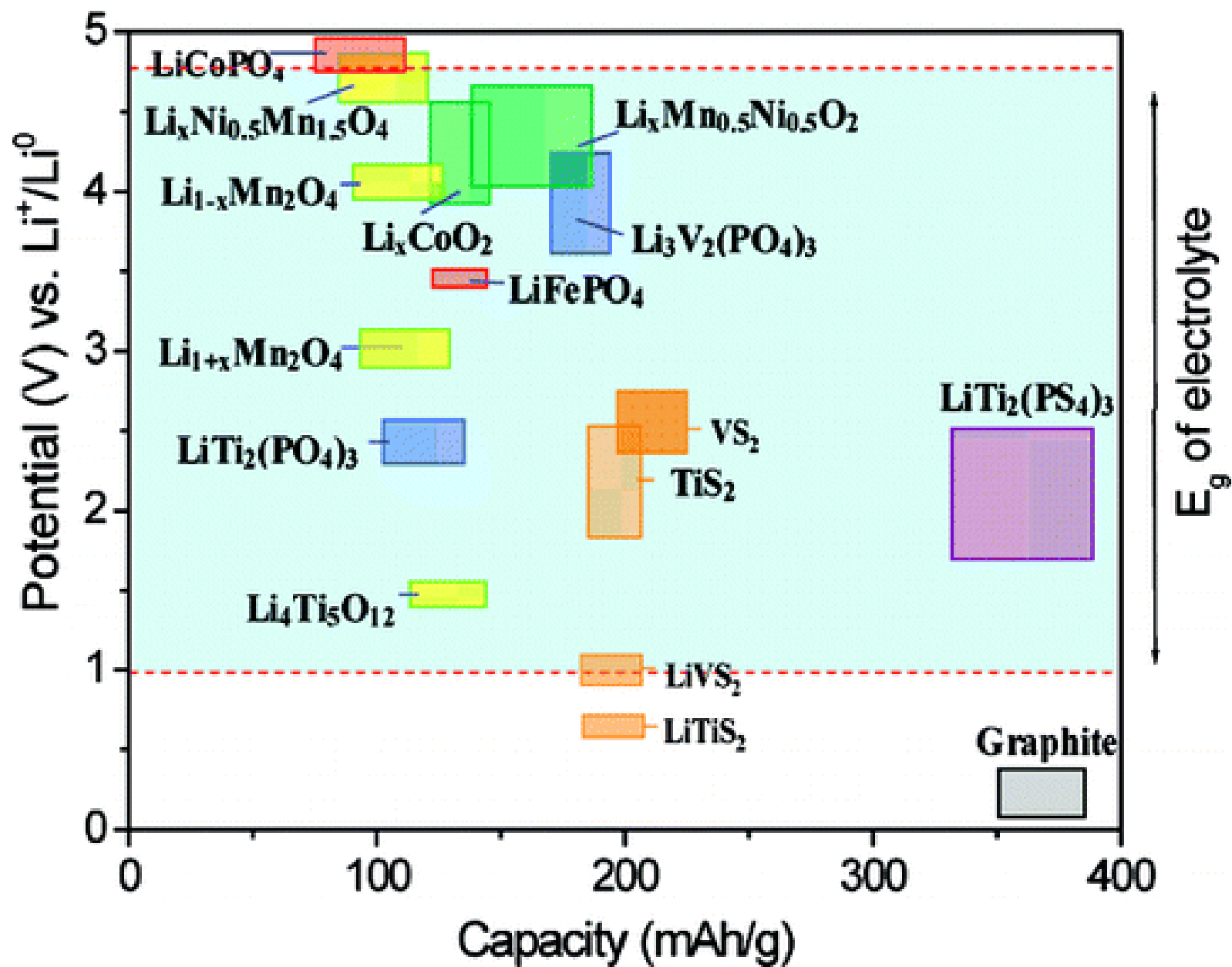
$$E^0 = -3.04\text{V}$$



Part 2 - Viability

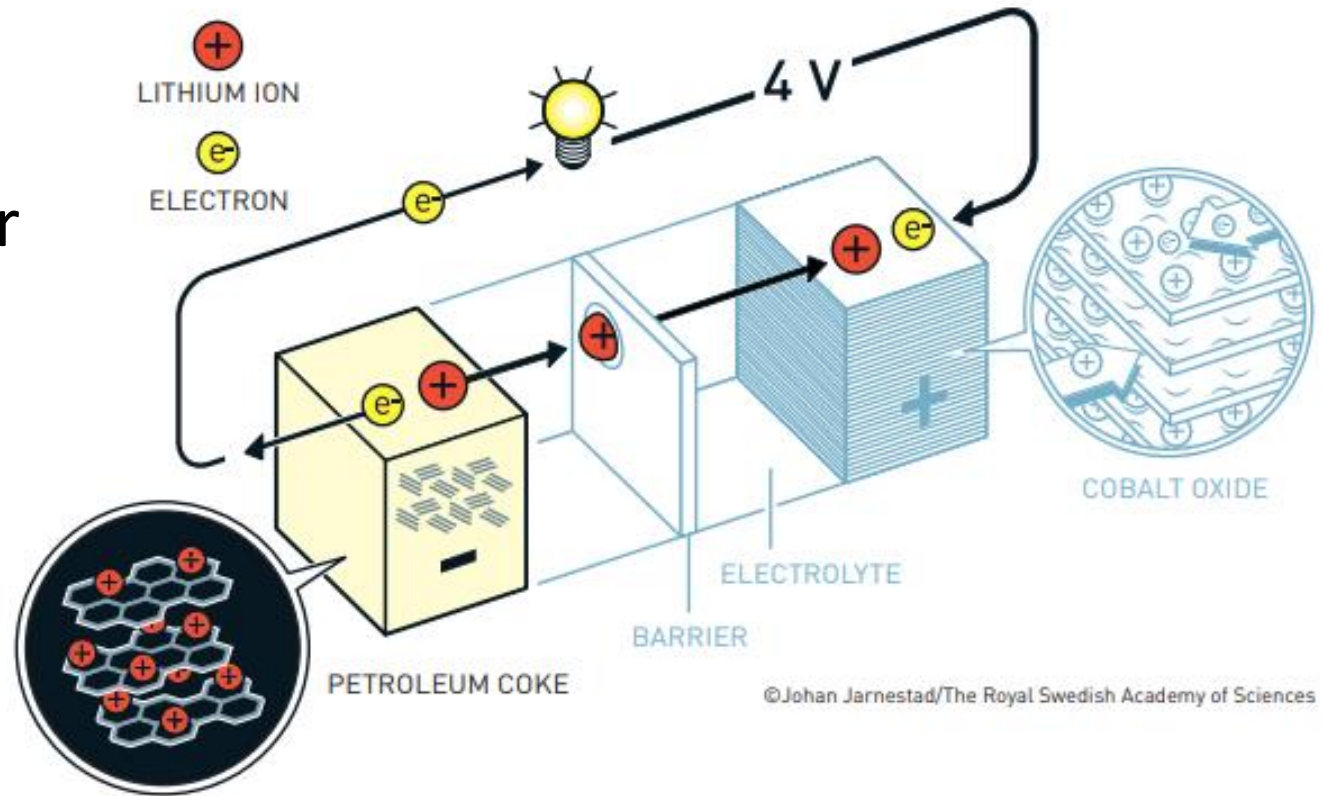
- Goodenough @ Oxford
- Systematic study of oxides





Part 3 - Safety

- Yoshino @ Asahi Kasei
- Mesoporous Graphite
- Aluminium current collector
- Separator



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The future of Lithium ion

- Safety concerns
- Recycling issues
- Beyond intercalation chemistry
- Beyond liquid electrolytes

