Technical and Ethical Considerations of Modern Battery Technology

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>
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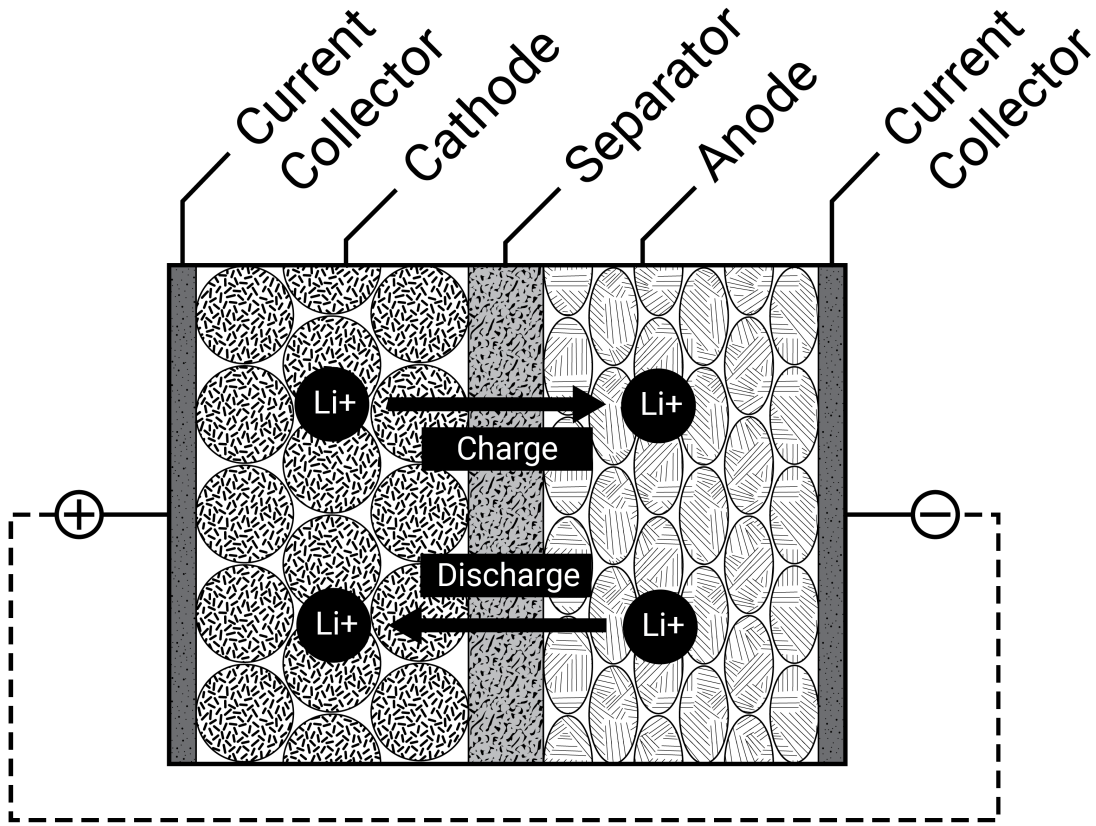
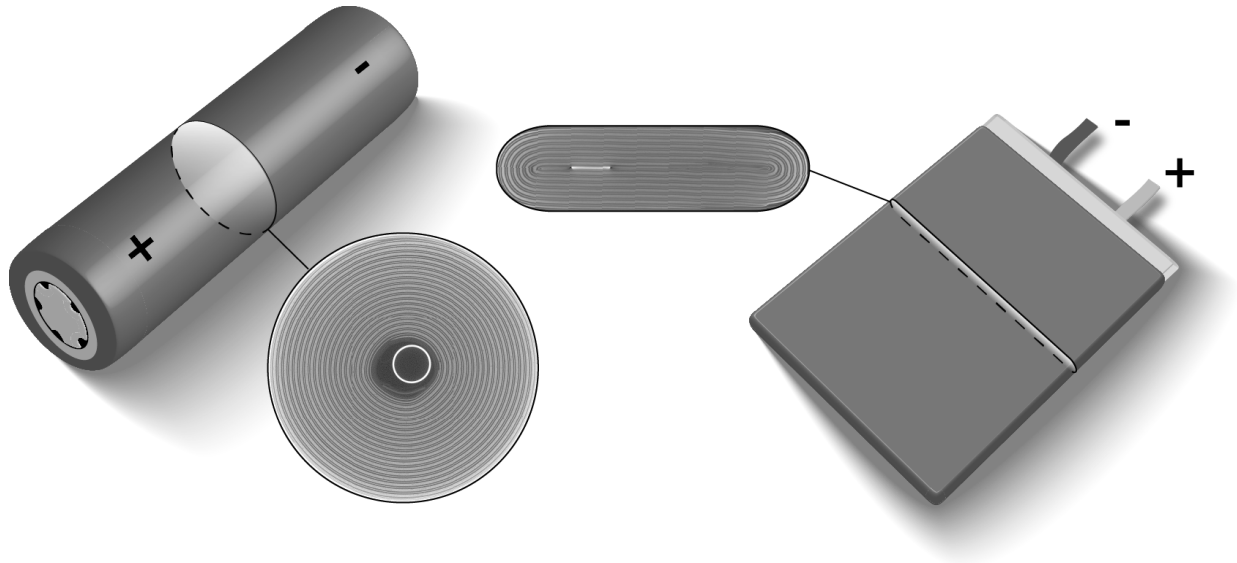
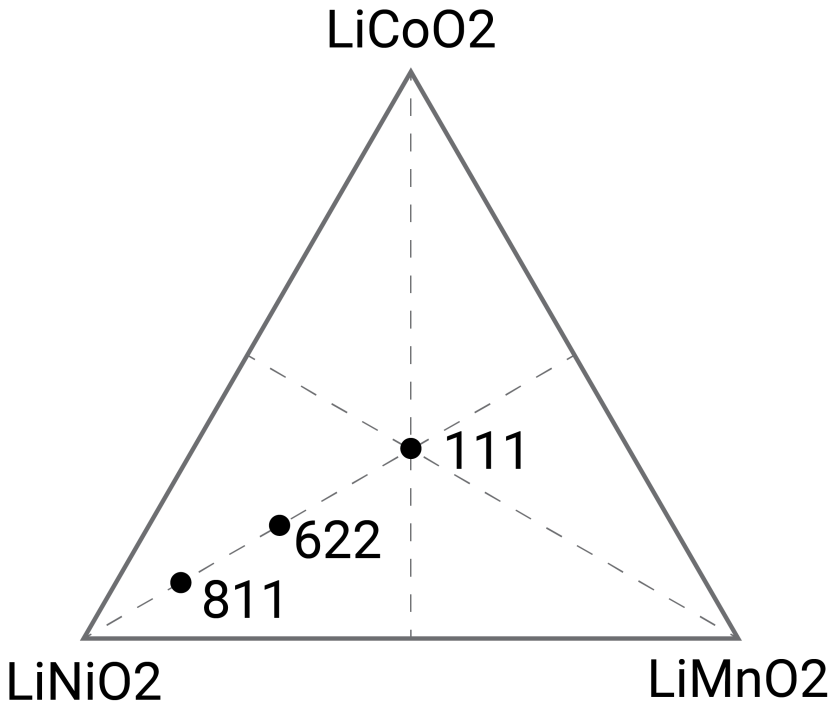
> Congo, child labour and your electric car
>
> — *Financial Times*

> We use less than 3% cobalt in our batteries & will use none in next gen
>
> — *@elonmusk, Twitter*

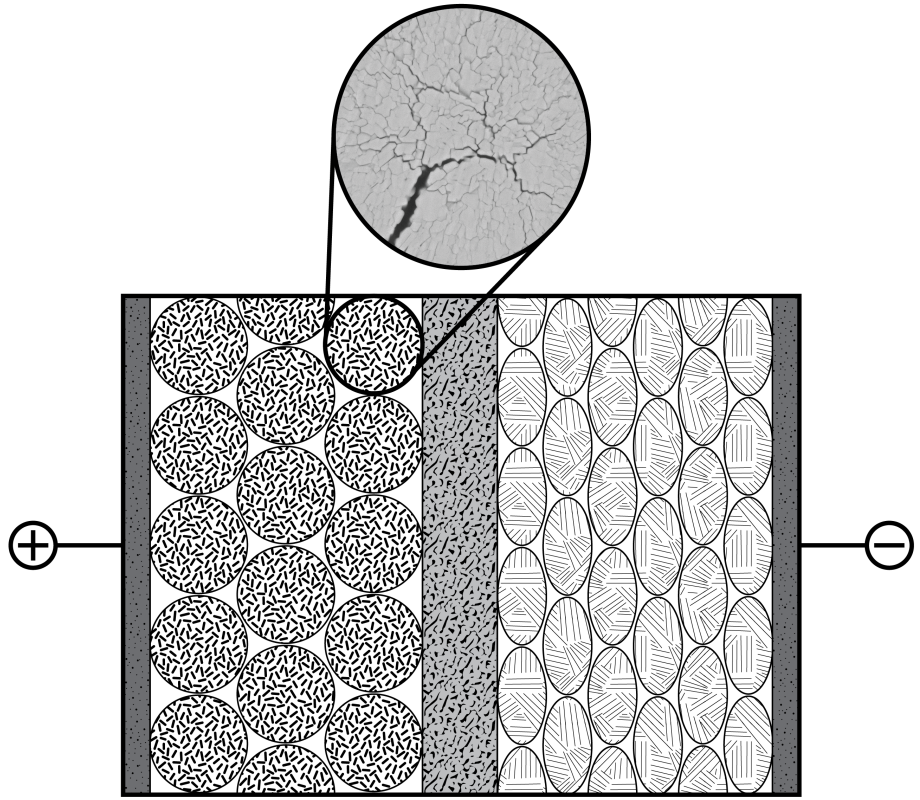
> Tesla May Soon Have a Battery That Can Last a Million Miles
>
> — *Wired*


Current Collector
Cathode
Separator
Anode
Current Collector
Li+
Li+
Charge
Discharge
Li+
Li+





$LiNi_{(1-x-y)}Mn_{(x)}Co_{(y)}O2$



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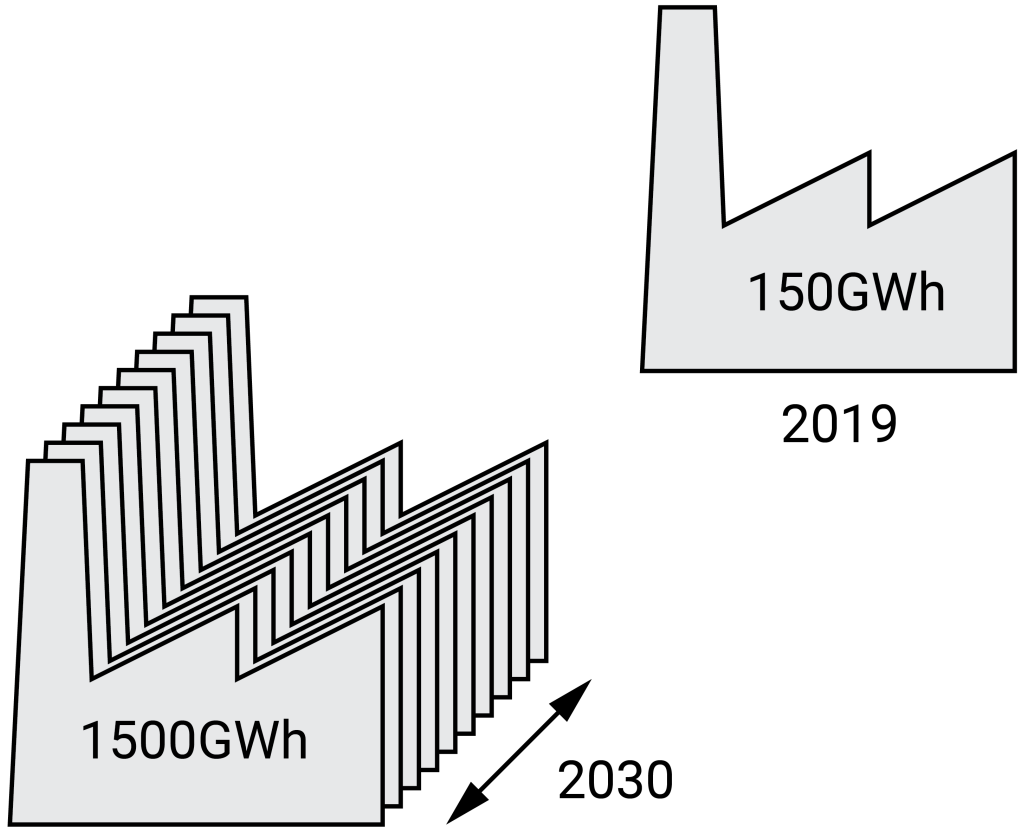
Lithium-Sulfur

Lithium-Oxygen / Air

Solid-Electrolyte

Lithium-Metal-Anodes

Mining


150GWh
2019
1500GWh
2030

Aluminum

Copper

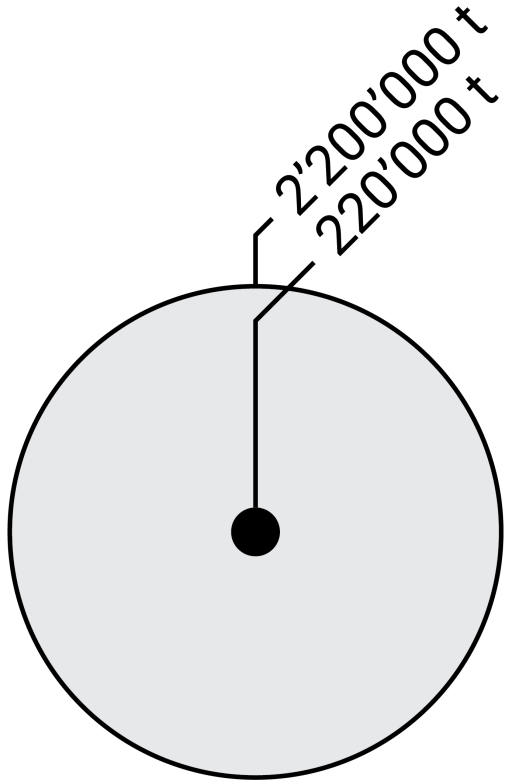
Graphite

Nickel

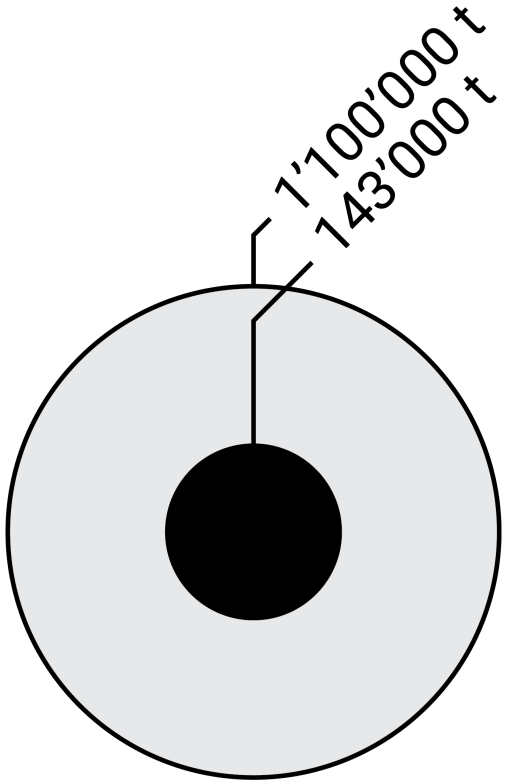
Lithium

Cobalt

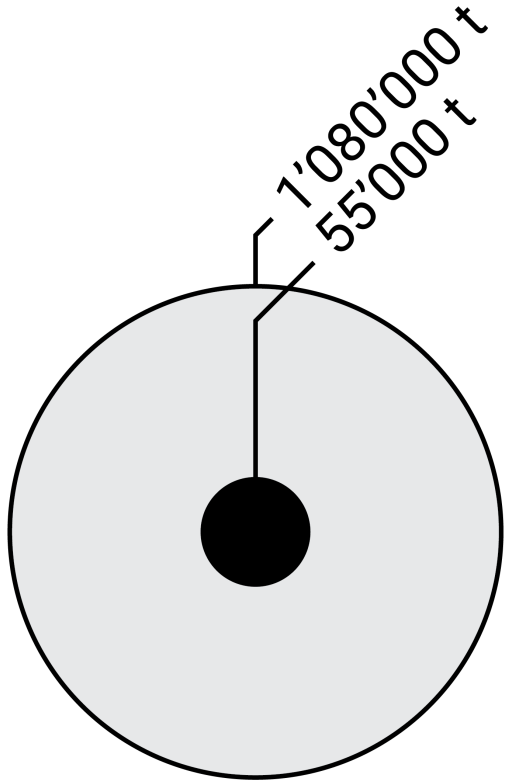
Copper



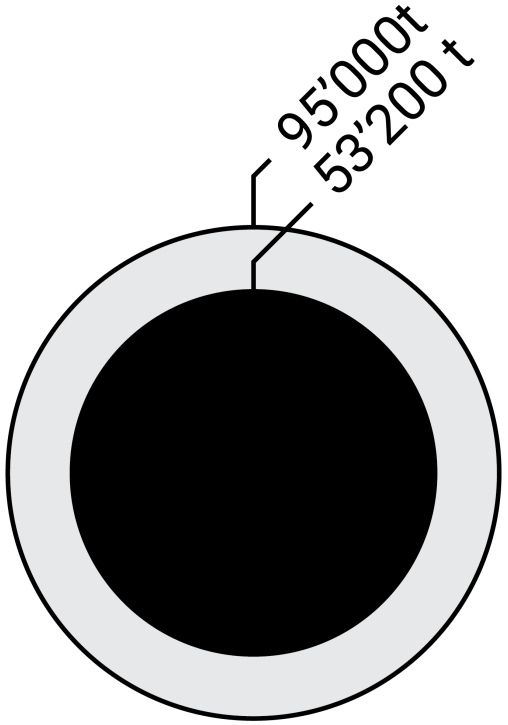
Graphite



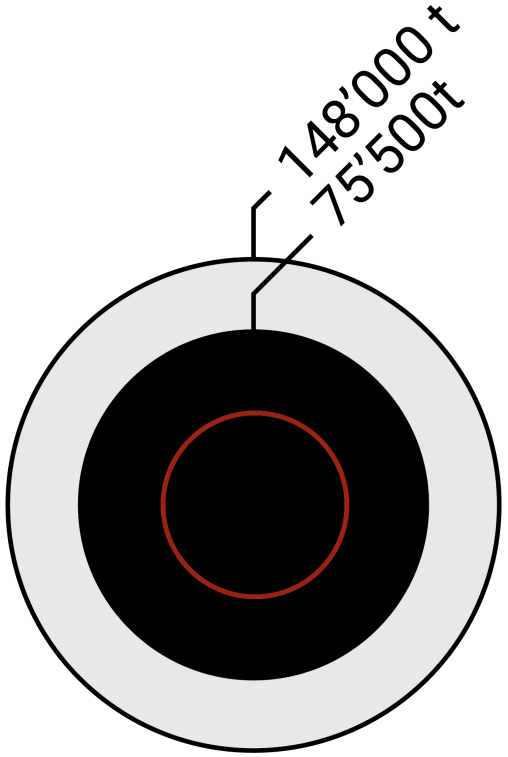
Nickel



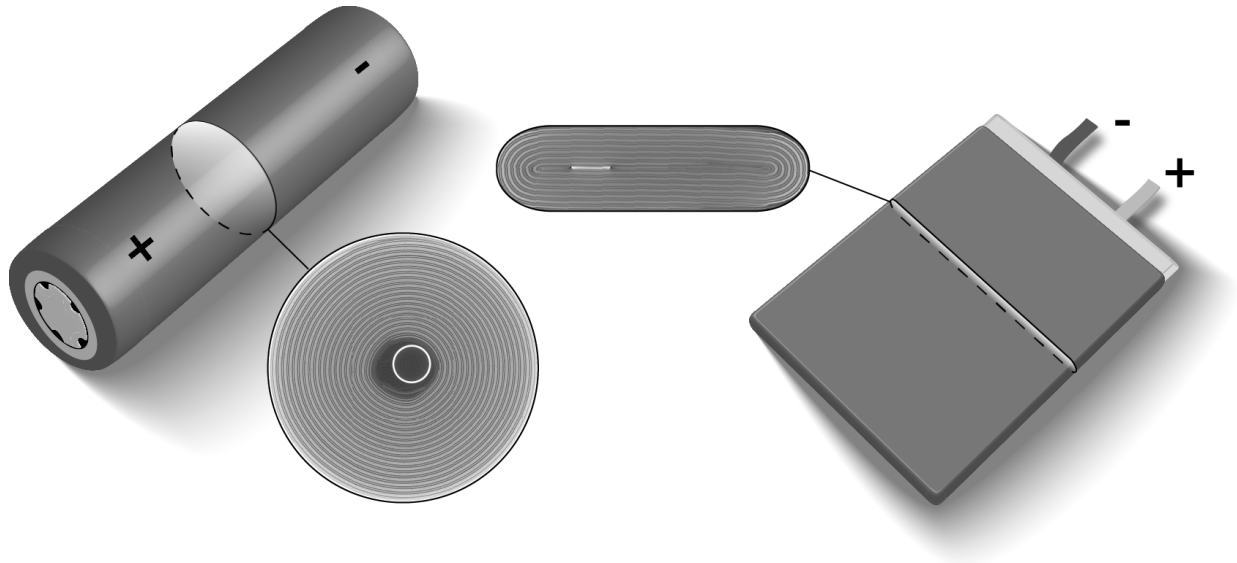
Lithium



Cobalt



Recycling



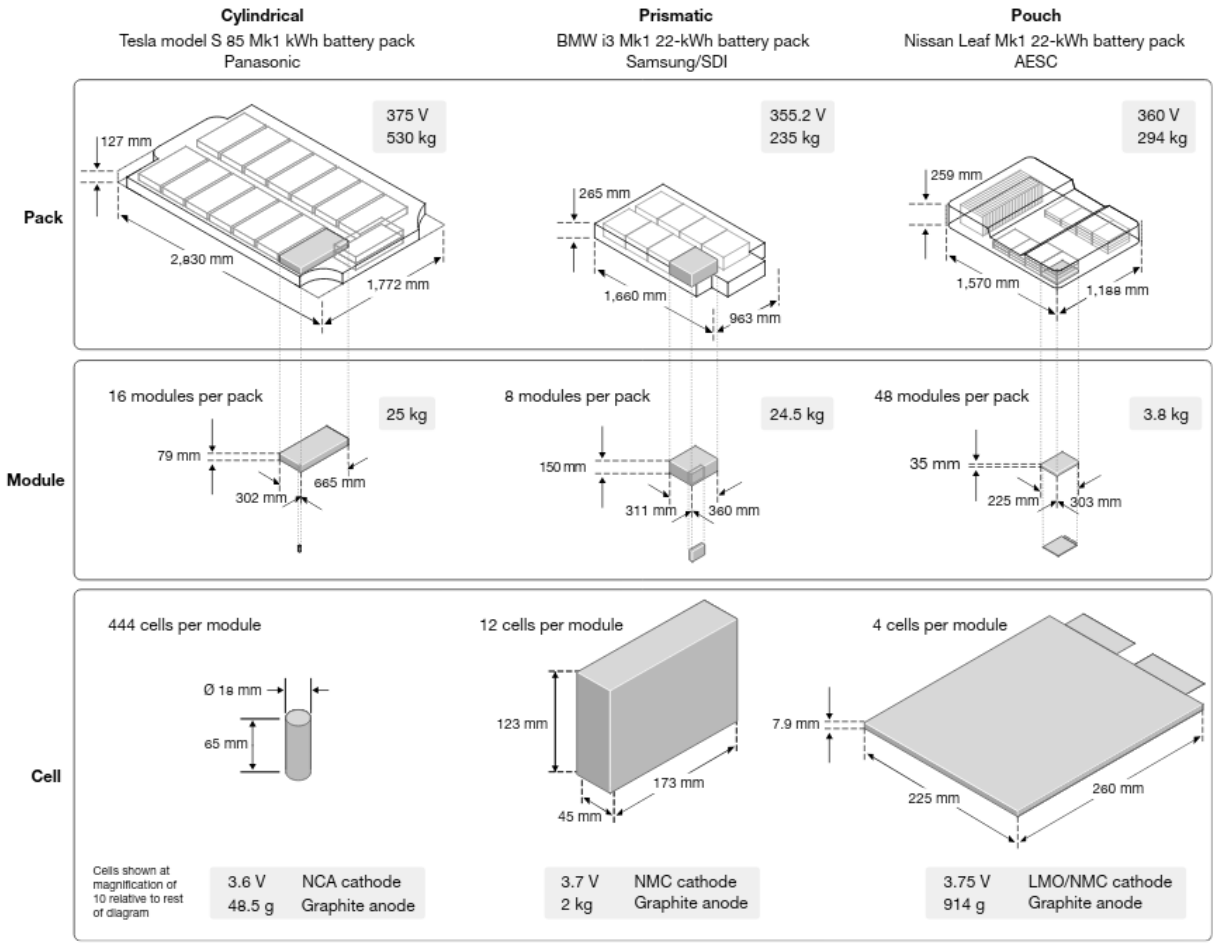
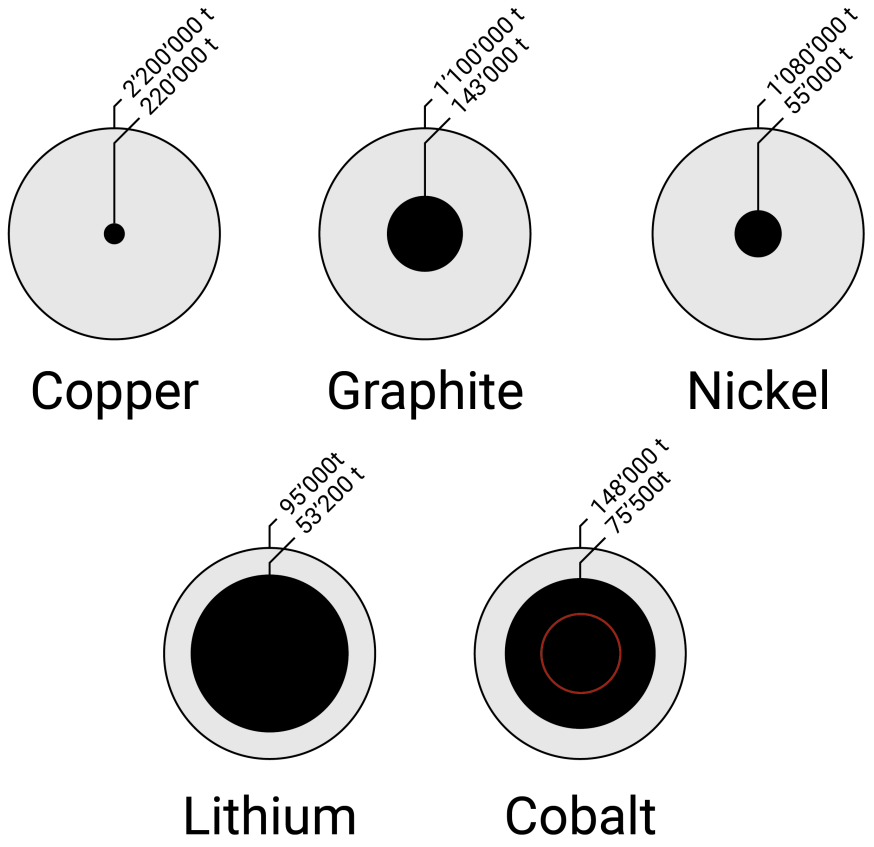


Figure adapted from [31]


2'200'000 t
220'000 t
Copper
1'100'000 t
143'000 t
Graphite
1'080'000 t
55'000 t
Nickel
95'000t
53'200 t
Lithium
148'000 t
75'500t
Cobalt

Ethical Considerations

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