



Tecnologies de bateries i aplicacions actuals

M. Rosa Palacín



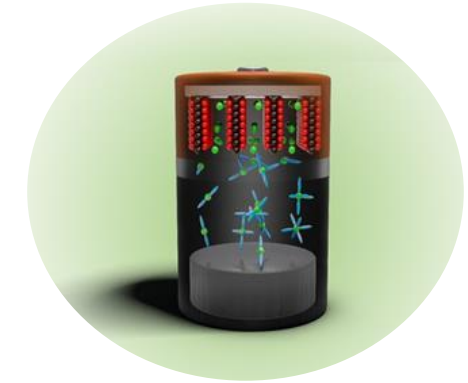
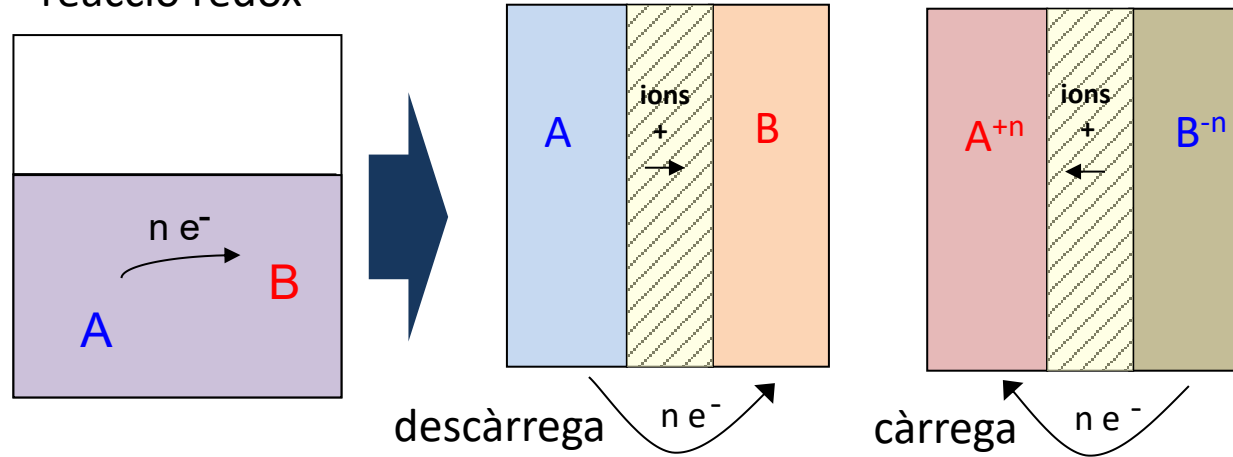
rosa.palacin@icmab.es



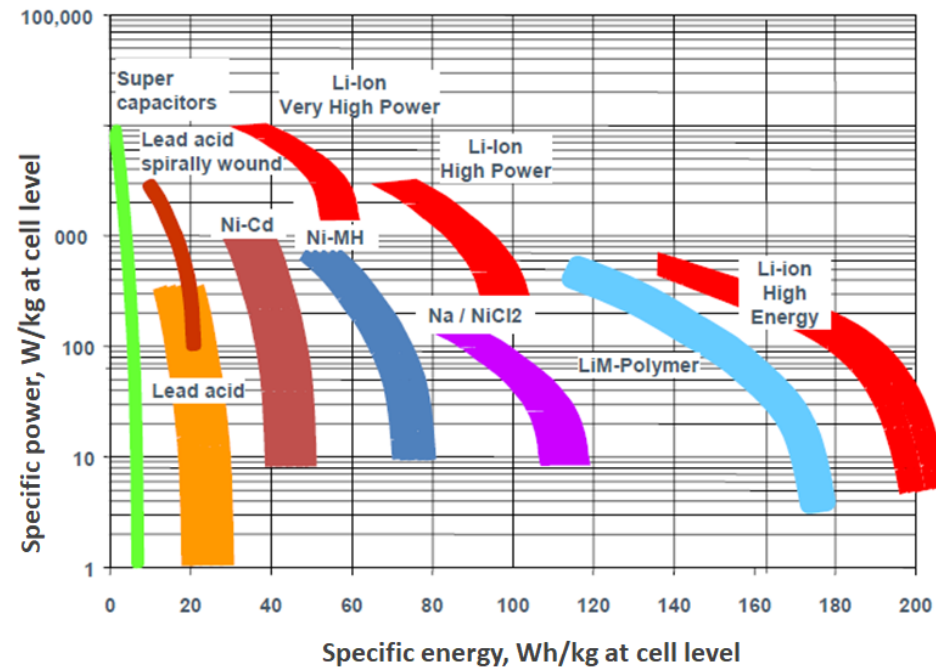
@MRosaPalacin

Què és una bateria?

reacció redox



... moltíssimes alternatives possibles però només algunes viables!



50 à 60 km en «Pédelec» $\Leftrightarrow$ 300-360 Wh (36 V, 8-10 Ah)

PbO-Pb
10-15 kg



Ni-Cd
7-8 kg



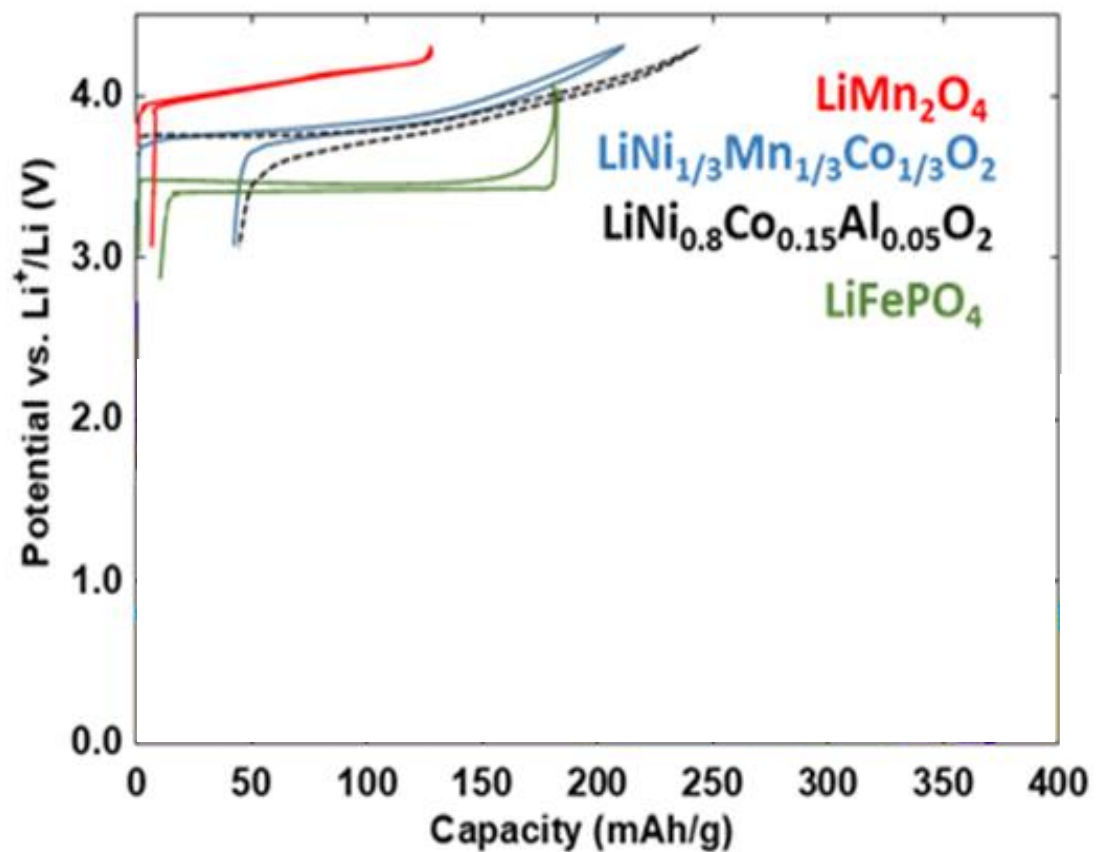
Ni-MH
6-7 kg



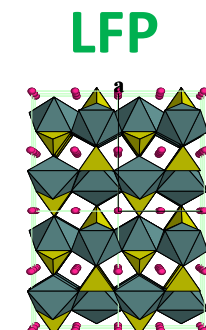
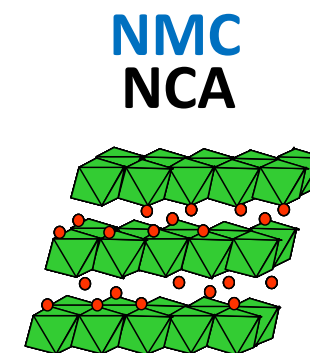
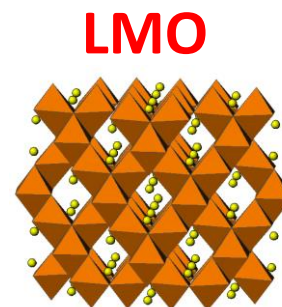
Li-ion
3-4 kg



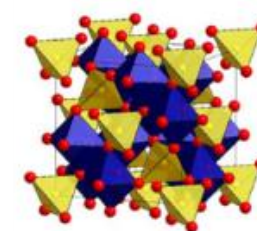
Bateries d'ió li



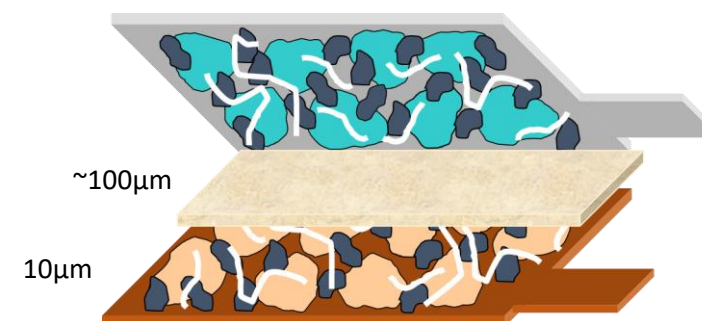
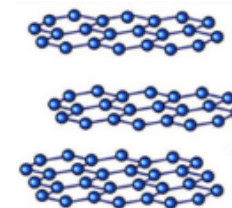
Electròlit: 1 M LiPF_6 (carbonats d'alquil)



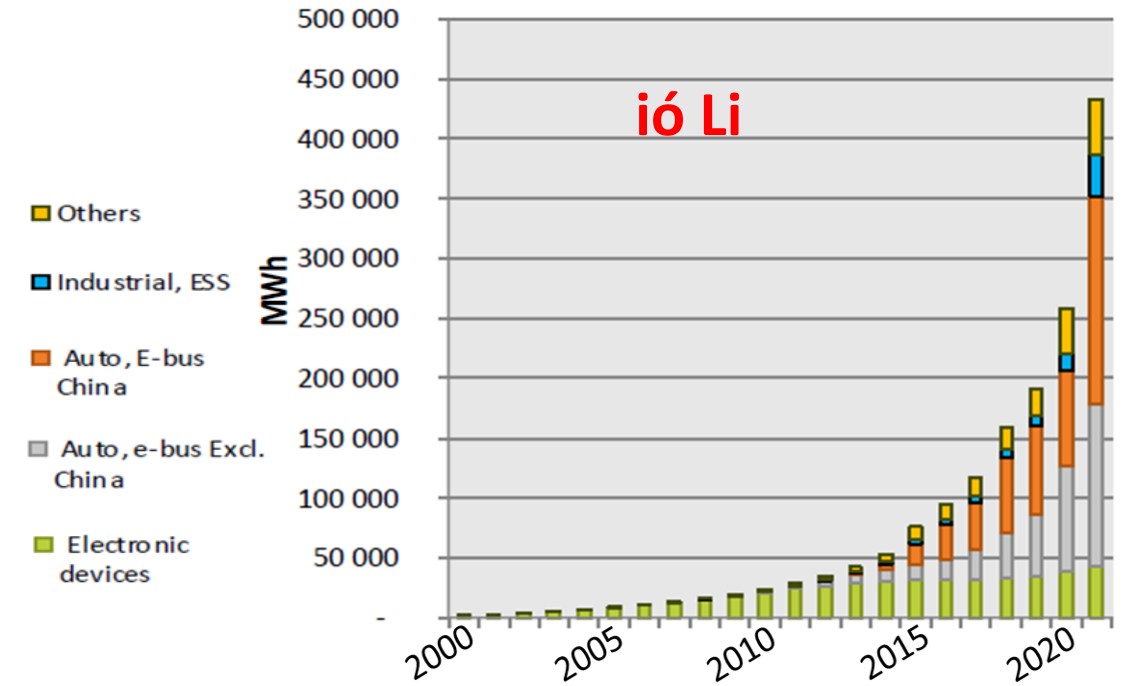
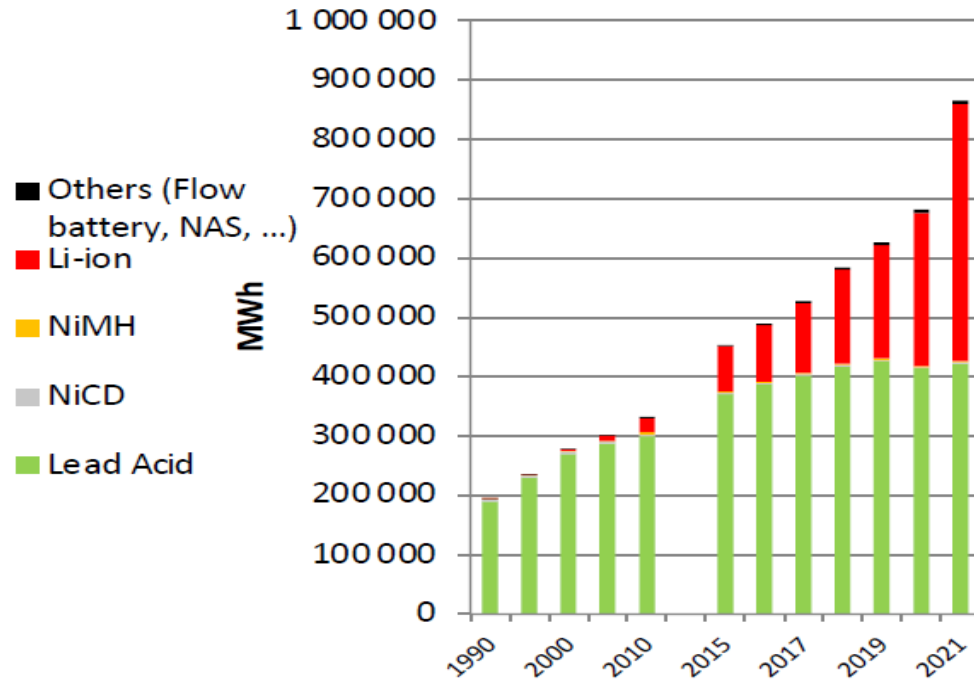
LTO



C



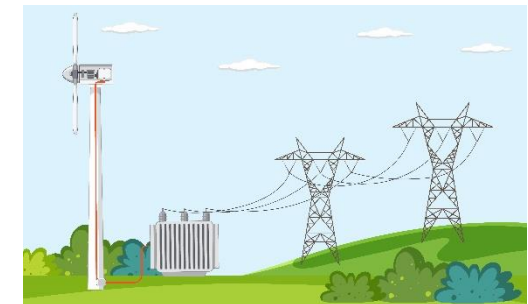
Context actual



≠



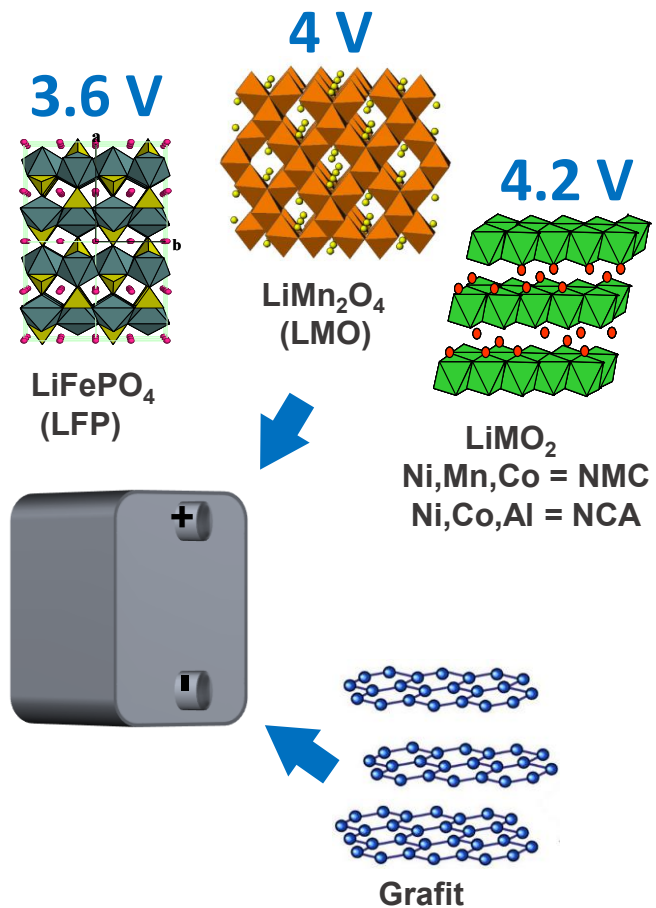
≠



Densitat energia
Seguretat
Vida/cost
Densitat potència

Seguretat
Densitat energia/potència
Vida/cost

Vida/cost
Escalabilitat
Densitat energia/potència
Seguretat



Escala



Reptes (I): cost

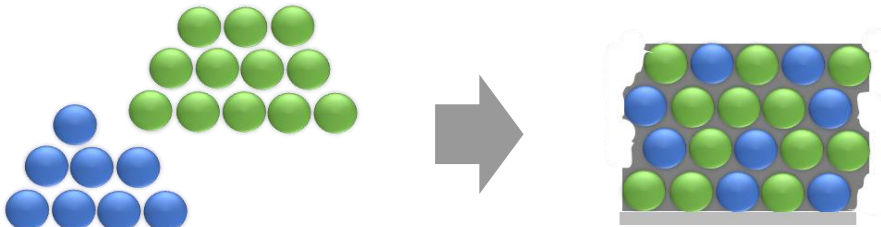


Materials: 70-80% del cost (cel·la)

Barreges de materials (“blend”) para abaratir cost



	Negative electrode	Positive electrode	Energy (kWh)	Driving range (km)	OEM and models
Li Energy Japan	C	LMO-NMC	16	160	Mitsubishi i-MiEV (2008)
Samsung SDI	C	LMO-NMC	24	140	Fiat 500e (2013)
Samsung SDI	C	LMO-NCA-NMC	22	130	BMW i3 (2014)
Samsung SDI	C	LMO-NCA-NMC	36	300	VW e-Golf (2016)
Samsung SDI	C	LMO-NCA-NMC	33	183	BMW i3 (2017)
CALB, CATL, SVOLT	C	LFMP-NMC	-	700-900	Chinese EV market (2023)
CATL	C-Si	NMC811	800	500	BMW iX3 (tbc)
AESC	C	LMO-NCA	24	135	Nissan Leaf (2010)
LG Chem	C	LMO-NMC	35.5	160	Ford Focus EV (2012)
LG Chem	C	LMO-NMC	26	150	Renault Zoe (2012)
AESC	C	LMO-NCA	30	172	Nissan Leaf (2015)
-	C-(Si)	NMC	80-110	500-700	BMW i5 (2021-2025)
Panasonic	C-Si/C-SiOx	NCA	60-100	330-500	Tesla X (2015)
Panasonic	C-Si/C-SiOx	NCA	75-100	490-630	Tesla 3 (2017)



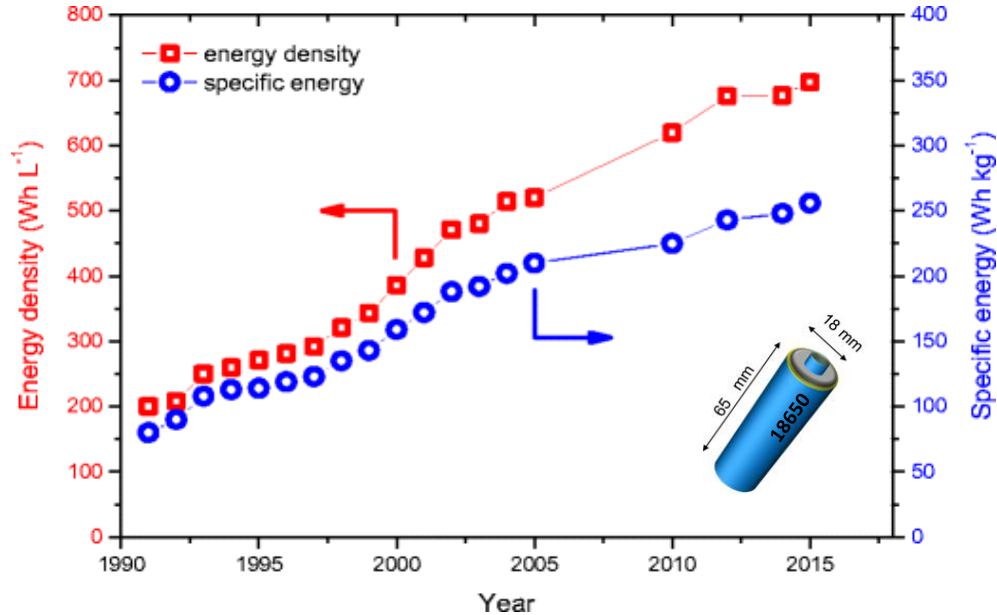
Interaccions poc estudiades
a nivell fonamental

(aspectes químics, cinètics
termodinàmics....)

C, graphite; LMO, LiMn₂O₄; LFP, LiFePO₄; LFMP, LiFe_{1-x}Mn_xPO₄; NMC, LiNi_{1-x-y}Co_xMn_yO₂; NCA, LiNi_{0.8}Co_{0.15}Al_{0.05}O₂

Reptes (II): Energia emmagatzemada

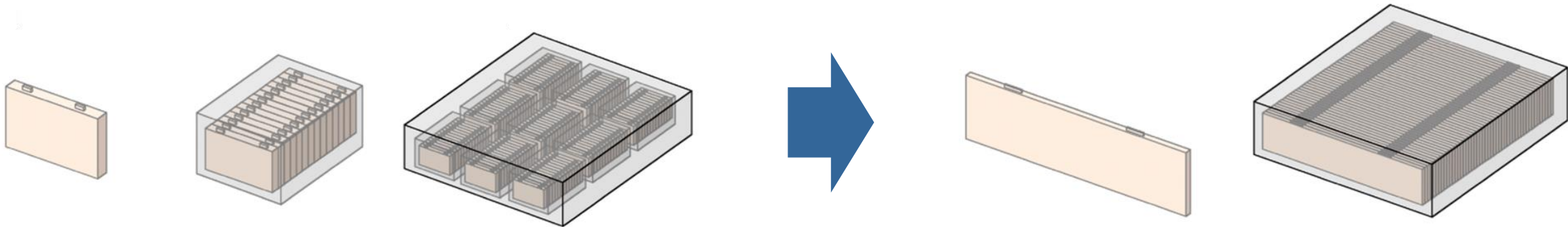
M. Winter, B. Barnett, K. Xu. Chem. Rev. 118 11433 (2018)



Materials actius

Materials inactius

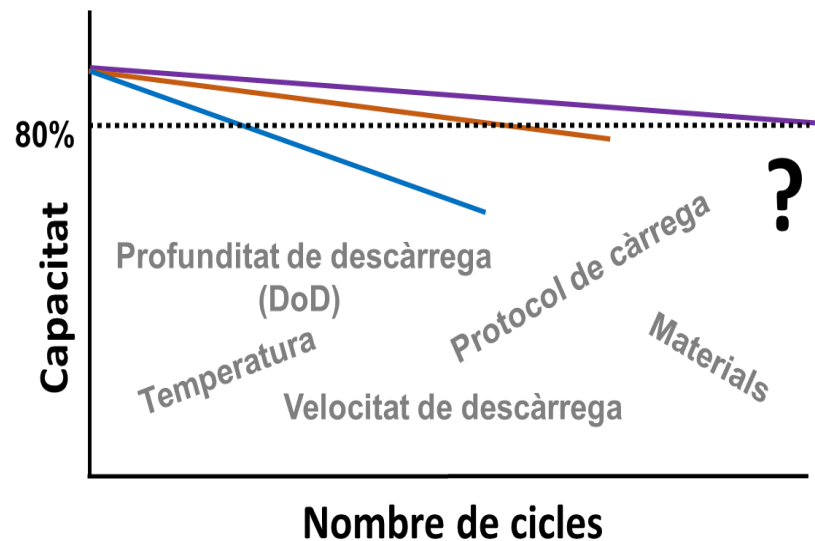
Disseny



Arquitectura

Cell-to-pack (CTP)

Reptes (III): durabilitat



- factors "biològics/genètics" (~ materials & disseny)
- "entorn/comportament" (~ condicions d'ús)
- "accès a atenció mèdica" (~ BMS)

