



Aalto University  
School of Chemical  
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# Lithium Ion Battery Innovations

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Aalto Energy Storage  
Futures Event 1:  
Electrical Energy Storage

# Why does our work matter?



**The need for cobalt  
is forecasted to double  
or even triple in the  
next 10 years.**

**CLOSELOOP**

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Cropped from original

P. Kauranen, Nordbatt 2017, Finland  
E. Olivetti et al., Joule (1) 2017 229

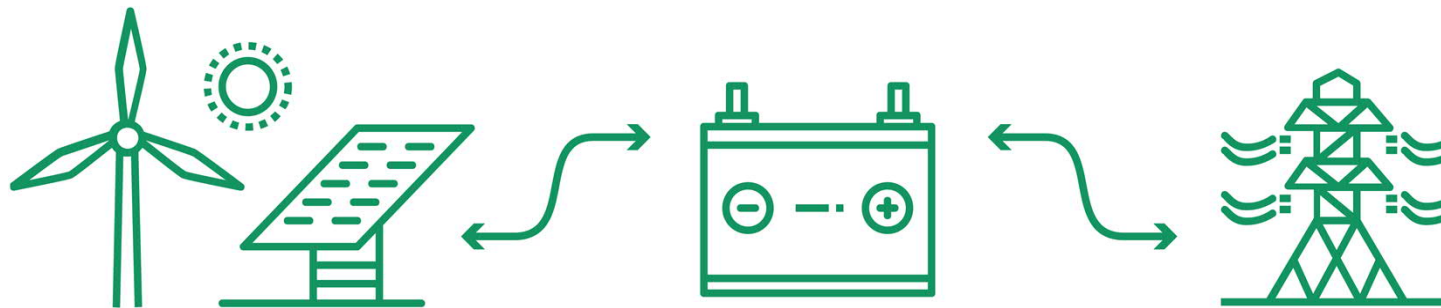
# Current & future battery applications



**TRANSPORTATION**

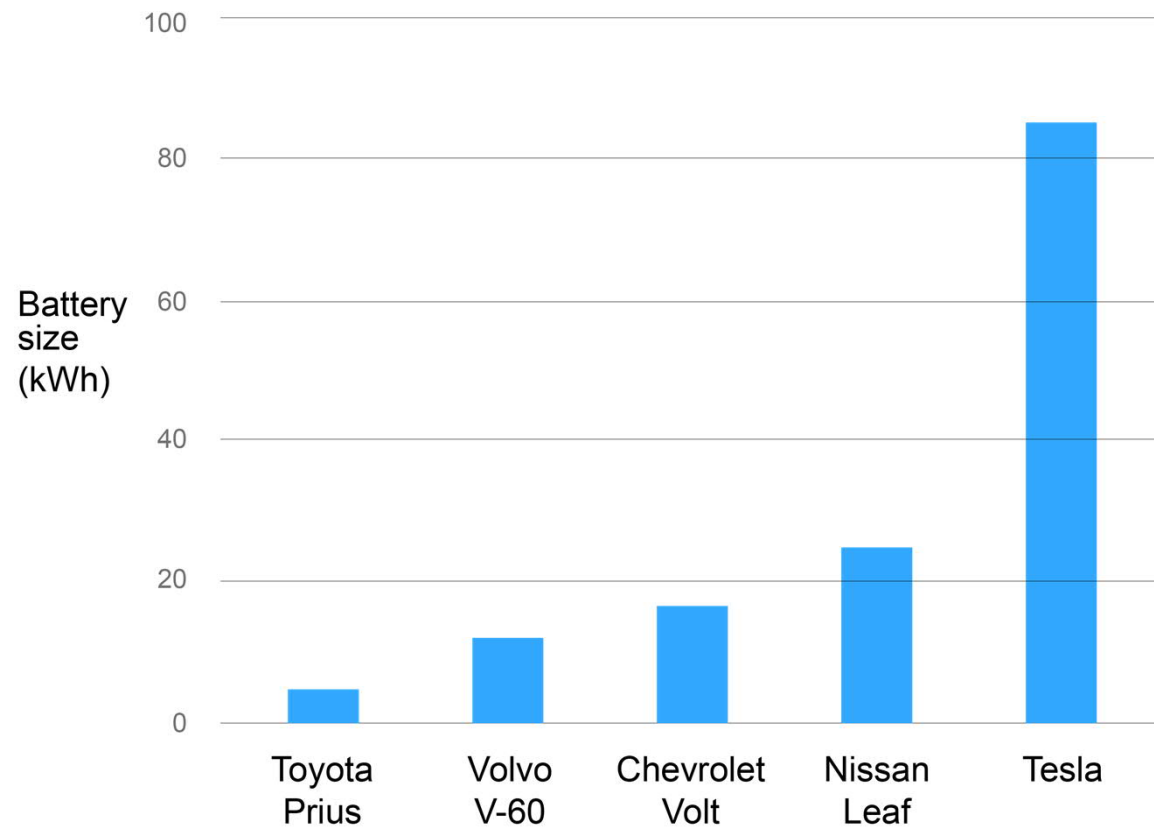


**PORTABLE DEVICES**



**RENEWABLE ENERGY & GRID**

# Increasing need for stored energy



# More properties, more energy needed



Siemens C10  
1999



NEC DB700  
2000



Nokia 6560  
2003



Nokia 6230i  
2006



Sony Ericsson T630  
2007



Sony Ericsson K800i  
2008

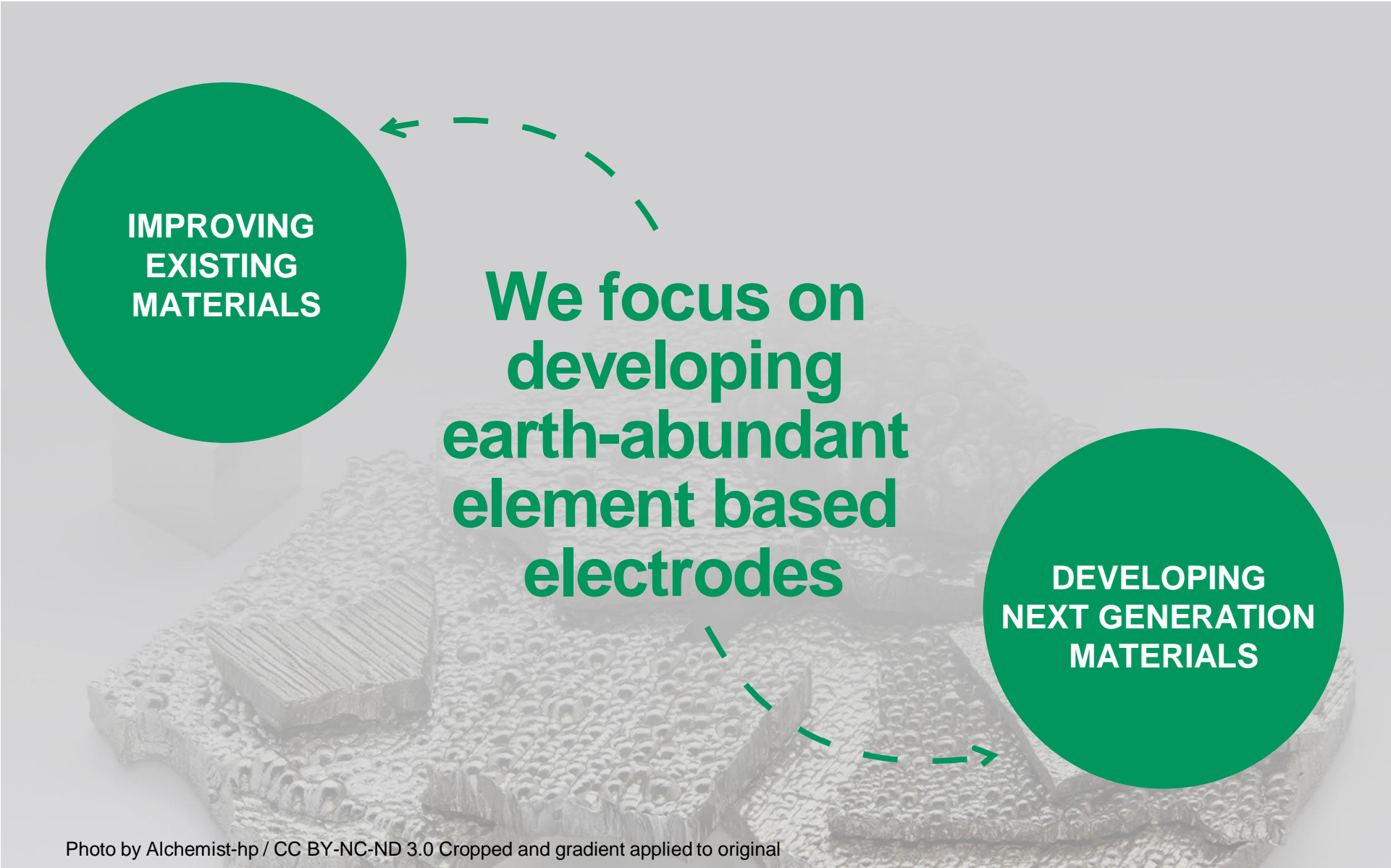


Samsung Wave  
2010



Sony Ericsson Xperia Arc  
2012

# What do we do & how we do it



**IMPROVING  
EXISTING  
MATERIALS**

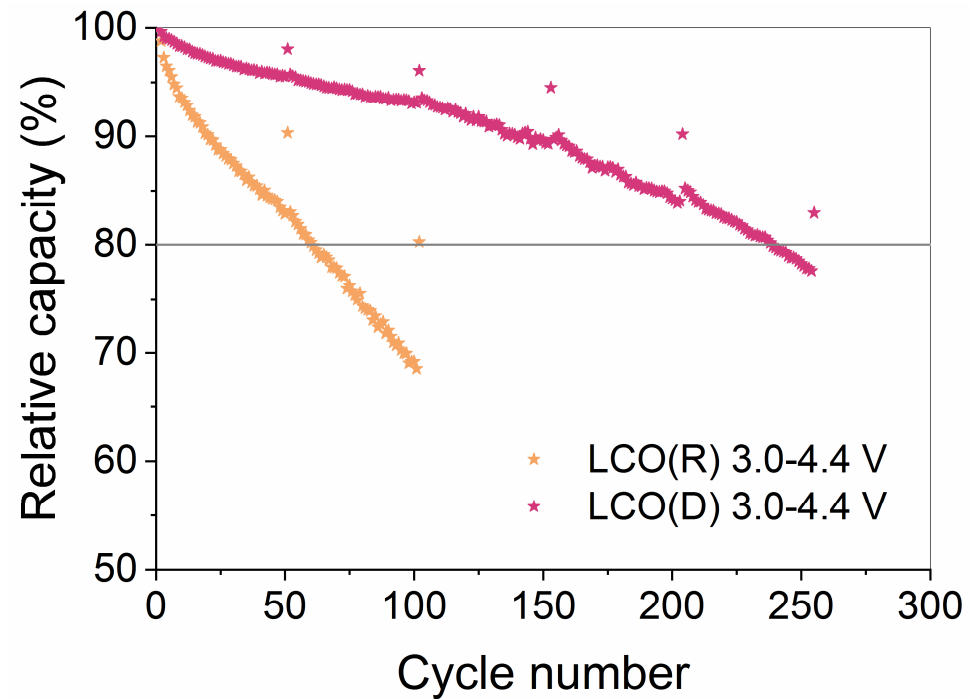
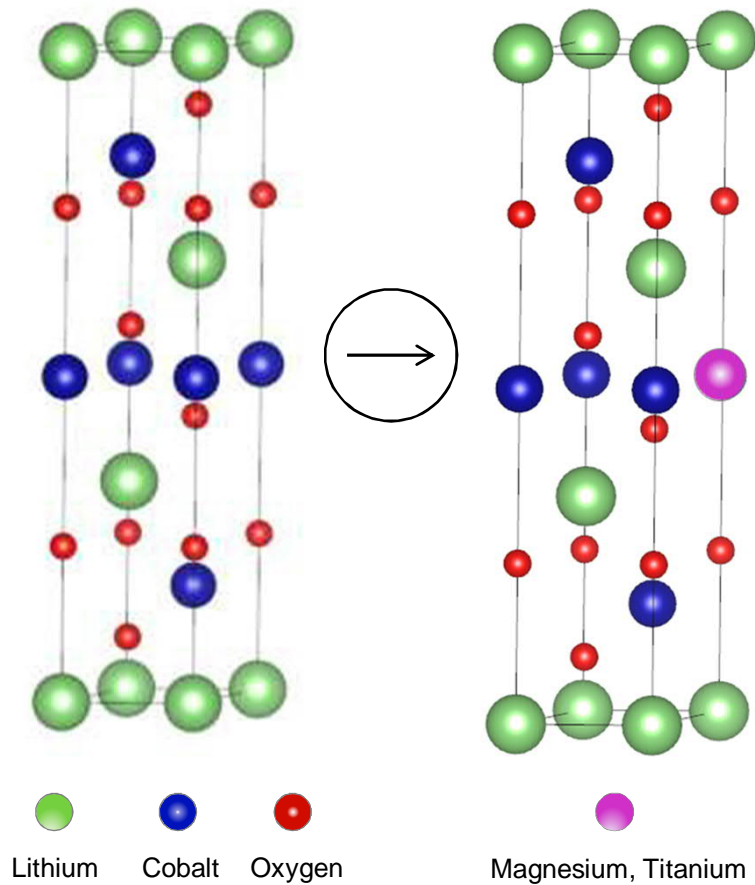
**We focus on  
developing  
earth-abundant  
element based  
electrodes**

**DEVELOPING  
NEXT GENERATION  
MATERIALS**



# Example 1: Improving existing materials

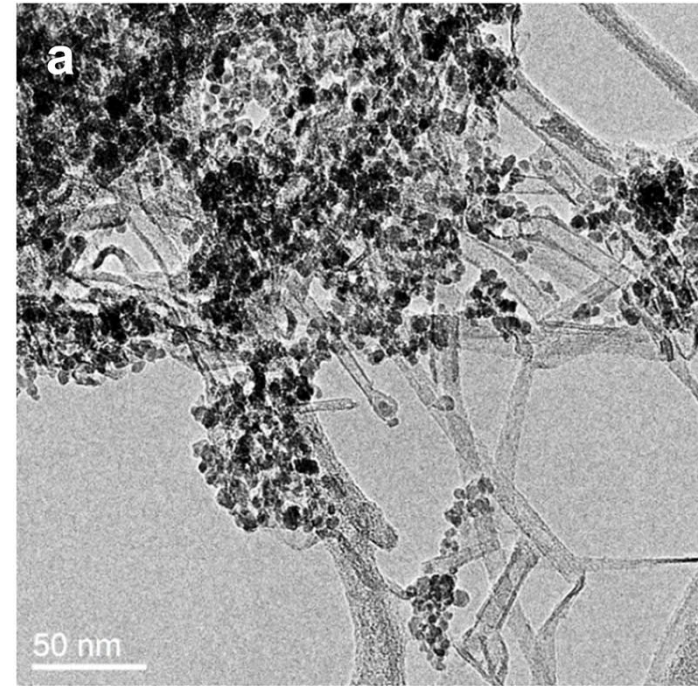
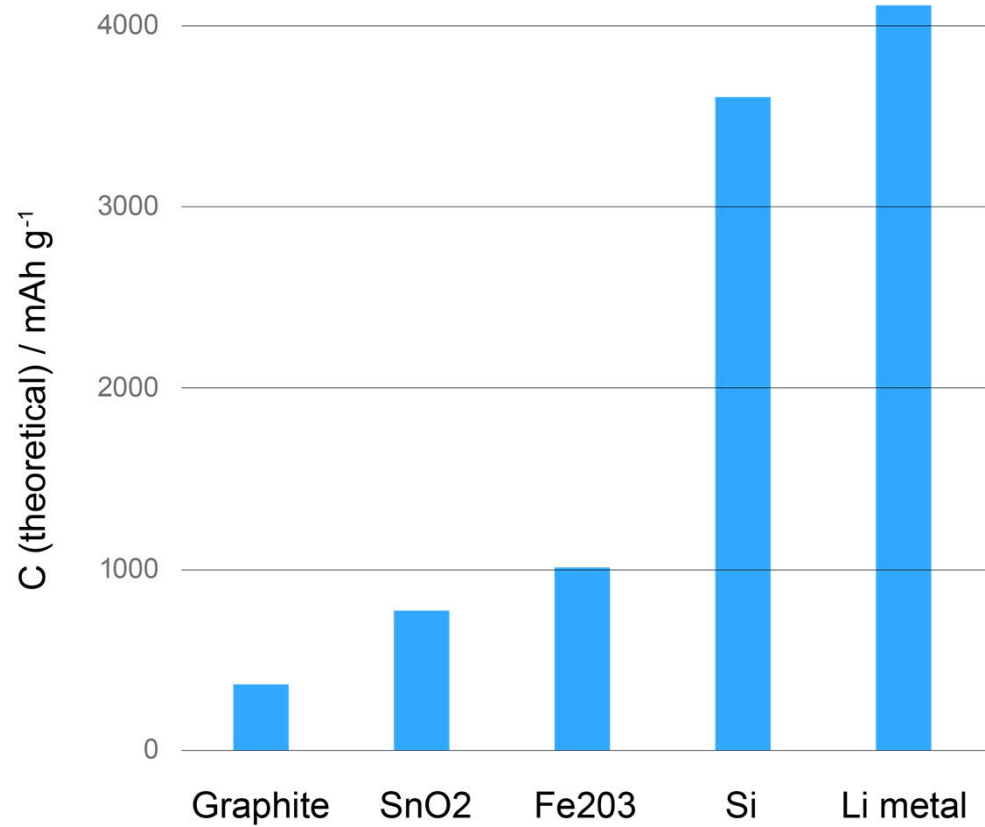
(lithium cobalt oxide positive electrode)



K. Lahtinen, Master's Thesis, Aalto University 2017  
K. Lahtinen et al. submitted

# Example 2: Developing new materials

(iron oxide negative electrode)





We need to  
improve batteries for  
storing energy

Photo by Jason Blackeye on Unsplash