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Atomic-level energy storage mechanism of cobalt hydroxide electrode for pseudocapacitors

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Batteries Supercapacitors

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Abstract

Cobalt hydroxide is a promising electrode material for supercapacitors due to the high capacitance and long cyclability. However, the energy storage/conversion mechanism of cobalt hydroxide is still vague at the atomic level. Here we shed light on how cobalt hydroxide functions as a supercapacitor electrode at operando conditions. We find that the high specific capacitance and long cycling life of cobalt hydroxide involve a complete modification of the electrode morphology, which is usually believed to be unfavourable but in fact has little influence on the performance. The conversion during the charge/discharge process is free of any massive structural evolution, but with some tiny shuffling or adjustments of atom/ion species. The results not only unravel that the potential of supercapacitors could heavily rely on the underlying structural similarities of switching phases but also pave the way for future material design for supercapacitors, batteries and hybrid devices.