

Nickel-cobalt-aluminum batteries nca georgetown

The two materials NCA and NMC have related structures, quite similar electrochemical behaviour and show similar performance, in particular relatively high energy densities and relatively high performance. Noteworthy, Ni is cycled during the battery operation between oxidation states +2 and +3.5, Co- between +2 and +3, and Mn and Al remain electrochemically inactive.

It is estimated that the NCA battery pack in a Tesla Model 3 contains between 4.5 and 9.5 kg of cobalt and 11.6 kg of lithium.

Lithium nickel oxide LiNiO_2 , which is closely related to NCA, or nickel(IV) oxide NiO_2 itself, cannot yet be used as a battery material because it is mechanically unstable, shows a rapid loss of capacity and has safety issues.

To make NCA more resistant, in particular for batteries that need to operate at temperatures above 50°C, the NCA active material is usually coated. The coatings demonstrated in research may comprise fluorides such as aluminium fluoride AlF_3 , crystalline oxides (e.g. CoO_2 , TiO_2 , NMC) or glassy oxides (silicon dioxide SiO_2) or phosphates such as FePO_4 .

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