Kolloquium Energie- und Halbleiterforschung

Universität Oldenburg
Institut für Physik
Abteilung Energie- und
Halbleiterforschung

Dienstag, 09.01.2018, 16.15 Uhr in W0 0-001

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Preparation of Core-Shell Battery Materials by Novel Dip Coating Methods

Lithium cobalt oxide ($LiCoO_2$) is currently the preferred cathode material for Li-ion batteries because it is easy to prepare and has a high specific capacity. One of the materials drawbacks it's fairly low conductivity. Another disadvantage is the materials high reactivity when charged (delithiated). Li_xCoO_2 can be charged to up to x = 0.5 which corresponds to 140 mAh/g (theoretically 274 mAh/g). It has been reported that this value can be improved to 200 mAh/g (x=0.7) by coating with Ti, Al or Mg[1)]. Substrate Induced Coagulation (SIC) is a dip-coating process that is capable of coating chemically different surfaces with finely dispersed nano-sized solid particles[2)]. "Core-shell" cathode materials with a shell layer to reduce the materials reactivity when charged formed by nano-sized titania[3)] and a layer of highly conductive carbon black[4)] are prepared by coating $LiCoO_2$ using the SIC method.

Chemical delithiation and exfoliation of Li_xCoO_2

Progressive chemical delithiation of commercially available lithium cobalt oxide ($LiCoO_2$) [5)] showed consecutive changes in the crystal properties. Rietveld refinement of high-resolution X-ray and neutron diffraction revealed an increased lattice parameter c and are duced lattice parameter a for chemically delithiated samples. Using electron microscopy we have also followed the changes in the texture of the samples towards what we have found is a critical layer stoichiometry of about Li_xCoO_2 with x…1/3 that causes the grains to exfoliate. The pattern of etches by delithiation suggests that unrelieved strain fields may produce chemical activity.

Acknowledgement

This work was supported by the Austrian Science Fund (FWF) in project J 2979 and the Special Research Program (SFB) "Electroactive Materials". The author would like to thank J. O. Besenhard for his guidance in the beginning of this project.

References

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