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Elektrische Ermüdung in Funktionswerkstoffen

TECHNISCHE UNIVERSITÄT DARMSTADT

Sonderkolloquium im SOMMERSEMESTER 2012

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New anode and cathode materials for high capacity anode of lihium batteries

A blend of phenyl-substituted, branched polysilane, (Ph2Si)0.85(PhSi)0.15, and polystyrene (1:1 in weight) has been transformed into a composite material consisting of graphene layers, Si-O-C glasses, and micropores through a pyrolytic polymerto-ceramic conversion. Several analytical techniques have been employed to characterize the Si-O-C composite material, demonstrating the presence of the three components in its host framework. The Si-O-C composite material performs well in electrochemical operations with a characteristic voltage plateau, offering a capacity of more than 600 mA h g-1. When polystyrene is not blended, the resulting comparative material is even less porous and shows a shorter voltage plateau in electrochemical operations. A broad resonance in the 7Li NMR spectrum recorded at low temperature can be deconvoluted into three components in the fully lithiated state of the Si-O-C composite material derived from the polymer blend. This result indicates that the Si-O-C composite material electrochemically stores lithium species in interstitial spaces or edges of the graphene layers, directly or indirectly the Si-O-C glass phase, and the micropores. However, both the Si-O-C glass phase and micropores are minor as electrochemically active sites for lithium storage, and interstitial spaces or edges of the graphene layers act as major electrochemically active sites in this composite material. Despite the excellent cyclability of the Si-O-C composite material, the voltage plateau disappeared over cycling. This phenomenon suggests that the microstructure is delicate for repetitive lithium insertion and extraction and that newly formed sites must generate the nearly equal capacity.

Die Vortrag findet um **16:00 Uhr** im Gebäude der Materialwissenschaften, Lichtwiese, Petersenstr. 23, **Raum 77,** statt.