Effect of thermal deposition of lithium on mesoporous carbon

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Mesoporous carbon materials possess high surface area and electrical conductivity, making it the perspective as anode materials for rechargeable Li-ion batteries. In this study, we used mesoporous carbon and nitrogen-doped mesoporous carbon materials, which were synthesis by CCVD method as a result of decomposition of ethylene, toluene and acetonitrile on a iron doped calcium tartrate catalytic system. To study process of interaction of Li with mesoporous carbon materials, the samples were exposed to Li vapor from a SAES Getter for 5 min at a current ~ 8 A under ultra-high vacuum. The changes in the electronic states of the samples after the deposition of Li vapors were studied by X-ray photoelectron spectroscopy and near-edge X-ray absorption fine structure spectroscopy using a equipment of the Russian–German beamline (RGBL) at the BESSY II synchrotron station. X-ray emission C K_α-spectra of mesoporous carbon samples before and after Li vapor deposition were measured on the laboratory X-ray emission spectrometer "Stearat". The lithiated samples were not exposed to air before X-ray measurements. It was revealed that concertation of Li in the lithiated samples is not higher than 6 at%. The lithium is located on the surface of the samples and is bound to the carbon materials, changing their electronic structure. The spectral features arising in the X-ray spectra after Li deposition were explained with help of DFT calculation.

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