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Characterizing novel anode materials for Li-ion batteries using TOF-GISANS

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Titania nanotube arrays are an interesting alternative anode material for use in Li-ion batteries due to their excellent cycling stability and enhanced safety compared to graphite. Moreover when such nanotube arrays are used as support for a thin silicon film, the resulting composite material has the additional advantage of a high lithium storage capacity. We present a detailed comparison of the morphology of such self-organised conductive TiO_2 nanotube arrays, with and without silicon coating, using TOF-GISANS technique. We obtain a prominent lateral correlation of the TiO_2 nanotubes of ~ 94 nm and an inner nanotube radius of ~ 46 nm. The porosity averaged over the entire film is extracted to be 49%. The nanotube radius is reduced to half (~23 nm) through the silicon coating, but the prominent lateral structure is preserved. Such in-depth morphological investigations over large sample volumes are useful towards development of more efficient battery electrode morphologies.

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