Studies of Lithium Diffusivity of Tin-Based Electrodes for Lithium-ion Batteries

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Tin (Sn)-based materials are alternative anode materials to graphite in lithium-ion batteries due to larger theoretical capacity (994 mAh/g) than graphite (372 mAh/g) and high electronic conductivity. It is generally proposed that rate performance depends on lithium diffusion kinetics. Lithium diffusivity is an intrinsic property of an electrode material. Measurement of lithium diffusivity of Sn-based anode materials has been difficult due to large volume change, the occurrence of severe interfacial reactions and particle cracking event. Recently we demonstrated that fluorine-doped Sn-Ni exhibits enhanced cycling performance in the presence of phosphate type electrolyte additive, by inhibiting the interfacial attack of acidic species present in the LiPF6-containng electrolyte and disconnection of particles. Here we report the studies of lithium diffusivity of fluorine-free or -doped Sn-Ni film model electrodes, which was obtained from variable rate cyclic voltammetry under interfacial stabilized condition.