# Investigation of lithiated tin oxide produced by ALD for high discharge rate thin film anode

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Thin films of lithiated tin oxide have been synthesized on stainless steel substrates by atomic layer deposition (ALD) with $LiN[(CH_3)_3Si]_2$, $Sn(C_2H_5)_4$, $H_2O$, ozone and inductively coupled remote oxygen plasma as precursors. Studies of the surface morphology by scanning electron microscopy show a strong dependence on oxygen source and synthesis parameters. According to the x-ray photoelectron spectroscopy measurements, the samples contain tin in the oxidation state +4. The thickness of the thin films for electrochemical performance was approximately less than 100 nm. Electrochemical cycling was conducted in the stable for the $SnO_2$ voltage range of 0.01–0.8 V [1]. However, during the earlier research [2] it was detected that in the first 20 cycles during cycling of tin oxide with metallic lithium as a counter electrode may have efficiency failure up to 95%. In the case of a closed system without unlimited concentration of lithium ions, this process is critical and may have an influence on capacity and cycling life. Development of lithiated thin films has increased first cycles efficiency and improved capacity. Lithiated tin oxide has shown a stable discharge capacity more than 1000 mAh/g during long cycling with an efficiency more than 99%. It should be mentioned that a theoretical specific capacity for tin dioxide is 991 mAh/g. Synthesized thin films have fast kinetics of Li-ion intercalation and excellent discharge efficiency at high C-rates, up to 40C [3], with a small decrease in capacity of less than 15%.

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**References:**

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