## Modification of Titania-Based Nanoparticles for Anode Materials of Li Ion Battery

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**Objective:** The present poster contribution aims at optimization of electrochemical properties of titania (N doped anatase  $TiO_2$  / N) and Li-Ti ternary oxides (Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub>, LTO) with respect to their performance as anode materials in Li-ion battery by using mechanochemical effects.

Experimentals: The mixture of anatase with 10 mass% urea was co-milled with a small amount of ethanol in a planetary mill, dried and subsequently calcined in air up to 450 °C for 1 h to obtain  ${\rm TiO_2}$  / N. LTO was prepared from stoichiometric mixture of anatase and LiOCOCH<sub>3</sub> (15 mass% ethanolic solution) was co-milled in a planetary mill, dried and calcined under argon up to 680 °C [1]. Product characterization and electrochemical properties are described in [1].

Results and Discussion: Cyclic voltammograms of the N-doped anatase, calcined at 450 °C at different scan rates are given in Fig. 1. Charge capacity was 196 mAh  $\cdot$  g<sup>-1</sup>, slightly higher than the theoretical capacity of anatase, 170 mAh  $\cdot$  g<sup>-1</sup>, presumably due to the coexisting second phase, TiO<sub>2</sub>(B), because of mechanochemical phase transformation [2]. Cyclic voltammetry of Li insertion into LTO was given in [1]. Its performance and charge capacity was better than commercially available LTO, despite relatively small specific surface area, 1.4 m<sup>2</sup>  $\cdot$  g<sup>-1</sup>. We are now paying efforts to obtain LTO with higher specific surface area.

**Conclusion:** Utilization of mechanochemical effects combined with subsequent optimized heat treatment pave the way to make the preparative methods of LIB anode materials more affordable.

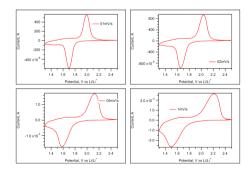


Figure 1: Cyclic voltammograms of the N-doped anatase, calcined at 450  $^{\circ}\mathrm{C}$  at different scan rates.

<sup>[2]</sup> Mechanochemical Preparation of Nanocrystalline TiO<sub>2</sub> Powders and their Behavior at High Temperatures, A. Gajović, K. Furić, N. Tomašić, S. Popović, Ž. Skoko, S. Musić, J. Alloys Compds. 398 (2005) 188.



Electrochemical Properties of Spinel Li<sub>4</sub>Ti<sub>5</sub>O<sub>12</sub> Nanoparticles Prepared via a Low-Temperature Solid Route, M. Senna, M. Fabián, L. Kavan, M. Zukalová, J Briančin, E Turianicová, P. Bottke, M. Wilkening, V. Šepelák, J. Solid State Electrochem. 20 (2016) 2673.