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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 ($Li_4Ti_5O_{12}$, 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 TiO_2 / N. LTO was prepared from stoichiometric mixture of anatase and $LiOCOCH_3$ (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 $mAh \cdot g^{-1}$, slightly higher than the theoretical capacity of anatase, 170 $mAh \cdot g^{-1}$, presumably due to the coexisting second phase, TiO_2(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 $m^2 \cdot g^{-1}$. 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.

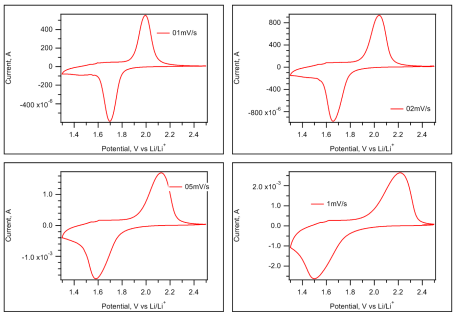

Figure 1: Cyclic voltammograms of the N-doped anatase, calcined at 450 °C at different scan rates.

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[2] Mechanochemical Preparation of Nanocrystalline TiO_2 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.

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