Nanocomposites and nanomaterials

Electrochemical characteristics nano-FeS_2 for Li-batteries application. Influence of macrostructure.

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Macrostructure and electrochemical properties of electrodes based on nano-structured FeS_2 and natural FeS_2 (pyrite) have been investigated and comparison. Methods of porosimetry (MSP), XRD, impedance spectroscopy, and galvanostatic cycling have been used. The non-aqueous polymer electrolyte has been based on the chlorinated polyvinylchloride.

Synthesized powder nano-structured iron disulfide has been synthesized by *Nano Group, Inc* (30–40 nm). Nano-FeS_2 comprised two types of the structures: FeS_2-pyrite of cubic syngony and FeS_2-marcasite with orthorhombic structure. The approximate quantitative composition is as follows: FeS_2-pyrite ≈ 72%, FeS_2-marcasite ≈ 17%, S-ortho up to 11%. The synthesized nano-FeS_2 has pores within the wide range of radius values of meso- (log (r)=1–2 nm), macropores (log (r)>2 nm) and the micropores with the radii, r<1 nm.

Structural characteristics of FeS_2 powder have been investigated as following: Integral and differential curves of pore volume distribution in terms of the radii; Density: a) nano-FeS_2: 3,171 g/cm^3; b)natural pyrite: 4,93 g/cm^3; Specific surface area: a) nano-FeS_2: 137 m^2/g; b) natural pyrite: 13,7 m^2/g. Results of investigation confirm that the electrochemical properties of the cathode based on nano-FeS_2 material are higher than in the case cathode based on the natural pyrite.

Investigations have been carried out in cooperation of USUCT, Enerize Corporation, Nano Group, and IPCE. The current presentation has been prepared in framework of NATO SPS 985148 project “Development of New Cathodes for Stable and Safer Lithium-Sulfur Batteries”