**Poster Presentation**

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## *Analysis of processes in Li-ion batteries by time-of-flight neutron diffraction*

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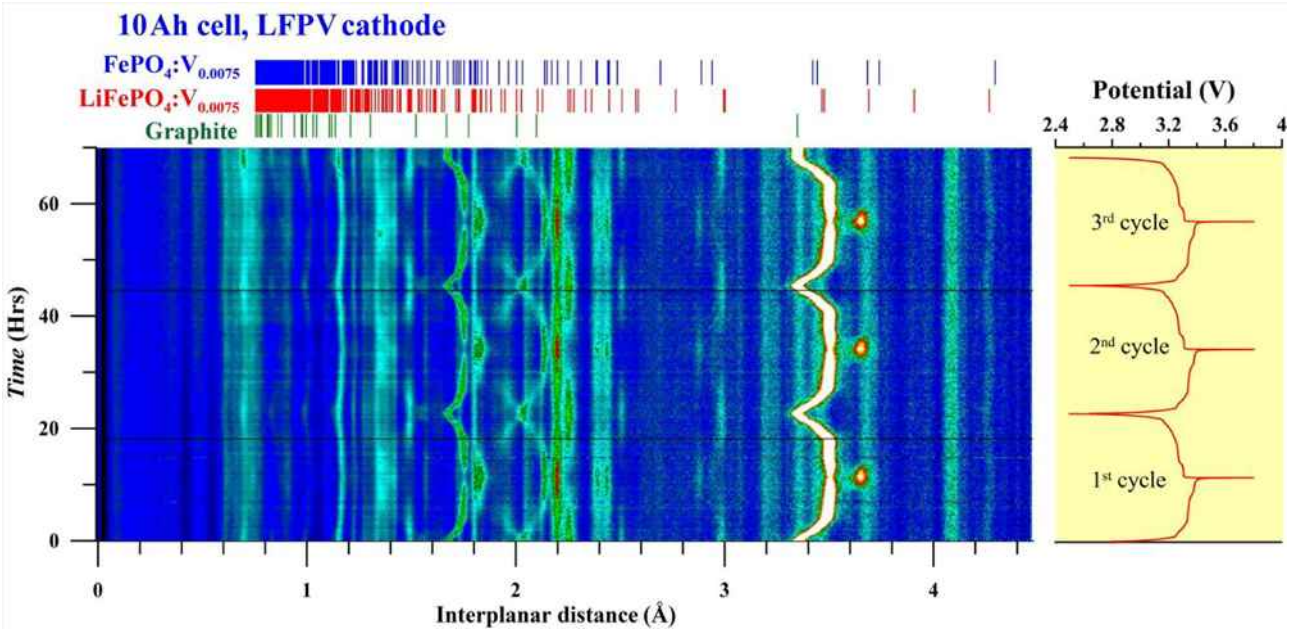
Ex-situ and in-situ neutron diffraction experiments were performed at HRFD time-of-flight (TOF) diffractometer (IBR-2 long-pulsed reactor, JINR) to characterize the entire battery system based on LiFePO4 and V-added LiFePO4 electrodes during electrochemical cycling and to find additional information about crystal structure of electrodes. Another purpose of this work was checking possibilities for in-situ experiments with real Li-ion batteries at the IBR-2 pulsed reactor. An important advantage of TOF method is the possibility to work at the fixed geometry of the experiment, which allows selecting the optimal battery orientation relative to the directions of the incident and scattered neutron beams and, thus, to minimize the difficulties associated with complex internal structure of the battery. It was shown that charge/discharge process of Li-based real Li-ion battery can be effectively studied by TOF technique at the IBR-2 pulsed reactor. Three full charge/discharge cycles were realized at room temperature (~17°C) with slow rate. The step-like appearance of several LiCn phases was observed and the volume fractions of LiFePO4 and FePO4 structural phases at different states of charge were determined. The analysis of changes in cathode material microstructure when doped with vanadium showed a significant increase in the density of defects, which correlates with better electrochemical properties of V-added LiFePO4 compared to pure LiFePO4.




**Keywords:** In-situ study, time-of-flight neutron diffraction, Li-ion batteries