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A system for neutron *operando* monitoring and diagnostics of materials and interfaces for electrochemical energy storage devices at the IBR-2 reactor'

The present-day studies of energy storage devices are facing the double challenge of obtaining the necessary structural information selectively from different electrodes and electrochemical interfaces in such devices and recording experimental data *in operando* conditions. The analytical techniques capable to explore electrodes and interfaces in the operando mode are very limited. In most cases, electrochemists work somewhat in the "dark", as they have limited ways to "see" how the electrochemical data correlates with direct experimental visualization of chemical transformations and structural evolution at electrodes and interfaces. There are only a few surface- and bulk-sensitive tools, which might potentially address the problem. However, as real electrochemical interfaces are buried, they are not, unfortunately, directly accessible to common surface science tools. In this sense, due to the extremely high neutron penetration ability the neutron scattering methods, like diffraction, reflectometry and small-angle scattering considered in the project provide a unique possibility to probe the elements of electrochemical energy storage devices without elaborate and often far-from-reality experiment design.

Another point worth noting is the user access to the scattering instruments around the IBR-2 reactor. User-friendly experimental environment at large-scale facilities like IBR-2 is a very important aspect for developing and enhancing the User Programs implemented at the neutron sources. For chemists, and especially for chemists working in the field of electrochemistry and employing quite a number of complementary methods, it is essential that the corresponding setups and equipment could provide them with the required experimental information with high efficiency. So far, the use of neutron scattering at research reactors for the purposes of electrochemistry has been hindered by the lack of proper infrastructure and more or less standard instrumental equipment which could be applied at different instruments. From this point of view, the project presented is very promising for solving this problem at the IBR-2 facility.

My opinion is that the implementation of the given project will make it possible for performing cutting-edge research at the IBR-2 reactor in JINR. There are a variety of scientific and applied problems which could be addressed using this new system. I would like to support the project and, as a representative of electrochemical community, express the hope that the designated system will be put into operation in the near future. A resource of this nature will surely product

high-impact results that will enable fundamental understanding of electrochemical interfaces relevant to all emerging electrochemical energy storage and conversion technologies (batteries, fuel cells).

Cordially,

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