New Liquid Synthesis Of Solid-State Electrolytes For The Next Generation Batteries

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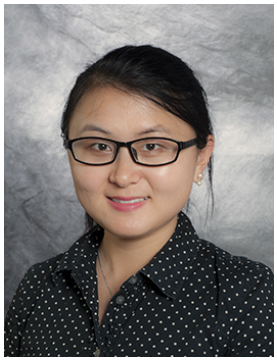
Abstract

All-solid-state batteries (ASSBs) are intensively studied as next-generation lithium battery systems and have made remarkable progress in recent years. Lithium argyrodites are relatively new and very promising class of sulfide-based lithium ion superconductors. They prove their high ionic conductivities and suitable electrochemical stability. In general, more convenient manufacturing methods for solid state electrolytes synthesis and their coating processing are highly desirable. Since up-to-date melt-quenching and high-energy ball milling methods are the most common laboratory approaches, a study on the solution synthesis method is still a milestone. In this work, lithium argyrodite (Li_7PS_6), a promising solid-state electrolyte was synthesized using new liquid synthesis approach. Similarly to the ball-milling methods, the molar ratio can be used to obtain this product, whereas the reaction time and homogeneity of the material is significantly improved. The total time of the preparation does not exceed 3 h. This argyrodite electrolyte has the best conductivity among argyrodite materials prepared by liquid method, the most probably due to its purity and homogeneity. This material is stable in the electrochemical window up to 5 V. The quick preparation, easy processing, and thin film casting from a liquid phase possibility makes Li_7PS_6 an attractive electrolyte candidate in the all-solid-state battery industry.

Biography of Presenter

Dr. Hui Wang is an assistant professor in Mechanical Engineering Department and also affiliated in Conn Center for Renewable Energy Research at UofL since 2016 fall. She obtained her PhD in Materials Science and Engineering at Michigan Tech University in 2013, and then joined Oak Ridge National Laboratory as postdoc. Hui's research interests are advanced solid materials for energy storage devices (i.e. batteries).