

Materials and Nanotechnology of high energy density batteries for the next generation

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The most important challenges for the green innovation are considered to be an investigation on the high capacity electrical energy storage devices, i.e., secondary batteries. Forecasting the green economy 2030 or later, replacement of gas- engine cars to hybrid (HV) and/or electrical vehicles (EV), introduction of smart grid consisting among solar cells/wind powers, geothermal/hydro powers, and high power/capacity energy storage systems are promising key technologies for the reduction of CO₂ emission and alternative power supply from nuclear ones. So, in the light of this context, the large scale investments on the researches of superior batteries are now being accelerated throughout Japan, US, EU, China, Korea and other area of the world.

For making those in the practical devices, an importance of the fundamental science and nanotechnology of the advanced battery materials have been strongly recognized for the development of next generation battery system with superior performances and new concepts of the energy storage mechanism. In this seminar, challenges of materials science for the next generation battery with multidisciplinary approaches are discussed. The issues are focused on the emerging new concept for the post-lithium ion batteries;

- All-solid state battery
- Metal- air battery
- s-block metal battery
- Polyvalent- cation battery
- Redox-flow battery

And these innovations are of course becoming realistic when science such as;

- High performance solid electrolytes
- Superior electrodes with 2 (or more) electron capacity
- Stabilization of the high capacity conversion reaction of the electrodes
- Reversible and stable cathode reactions in the air electrodes
- Enhancements of a charge transfer rate of the electrode/electrolyte interfaces

are in full understood.