[별첨4_CP 양식]

CONCEPT PAPER

for KIER International Cooperation project

Personal Data	Name of PI	Younghyun Cho	Organization	Korea Institute of Energy Research
	Department	Separation and Conversion Materials Laboratory	Title	Senior Researcher
	Cell Phone #	+82-10-9291-8642	E-mail	yhcho@kier.re.kr
Title	Nanostructured Organic Electrodes for Electrochemical Energy Storage Devices			
Description	-Barrier(s) to tackle Li-ion batteries have become the major power sources for consumer electronics by using transition metal oxides or metal phosphates as the positive electrode (cathode) materials. However, large-scale applications, such as electric vehicle, smart grid, and renewable energy storage have been urging the development of more cost-effective and sustainable organic electrode materials to increase the energy storage density per unit cost. Organic electrode materials consist of earth abundant-elements, such as carbon, nitrogen, and oxygen. Extensive research efforts have been focused on developing organic electrodes, such as conducting polymers, having stable redox reactions from the early history of rechargeable batteries. However, these organic electrode materials suffer from poor cycling stability and low power density due to the low electrical conductivity. Therefore, improving the cycling stability and the power capability without sacrificing their energy density remains a major challenge in the development of cost-effective and sustainable organic batteries. -Strategy to solve It is expected that nanostructured organic electrodes with the fine control on the surface functionalities and optimized nano-architecture designing significantly improve their performances including high energy density, high power density, and cycling stability compared to conventional inorganic and organic electrodes. **-Understanding the Role of Functional Groups on Charge Storage Reactions** **-Preparation of Nanostructured Electrodes** **-Assessing Battery Performance of the Organic Electrodes**			
Outcomes*	Specific capacity: >170 mAh/g (Current inorganic cathode: ~150 mAh/g) Maximum power density: >100 kW/$kg_{cathode}$ (Current inorganic cathode: ~10 kW/kg) Cycling stability: 80% retention after 10,000 cycles (Accelerated cycling condition) Cost down target: $10/kW (Current high-power Li-ion battery: $30/kW) CO2 emission abatement: Non-CO_2 generating organic source -Publications and/or Patents: At least three top journals/year			