

# Theme : Next Generation Battery

## Subject : High Efficient Supercapacitor

### Introduction

The goal of this research project is to develop pseudocapacitor material for fast charging that can decrease charging time into 30 to 40 minutes for smartphone. (Currently, charging time is approximately 2 hours).

Since pseudocapacitor possesses characteristics of both battery and capacitor, we expect excellent energy and power density to solve smartphone users' inconvenience. Therefore, based on existing LiB technology, novel materials for capacitor should be explored. Ultimately, the proposal is to solicit ideas behind new architecture, novel surface modified materials, electrode design for pseudocapacitor device for potential applications such as storage for mobile, portable, wearable devices.

### Scope

Challenges that significantly advance the state-of-the-art energy density( $>>10$  Wh/kg) in Pseudocapacitor(lithium ion capacitor, etc.) technologies include :

- Exploration of new materials such as
  - Nanostructured cathode materials,
  - Conductive polymer binder materials
  - Electrolyte/separator with high li ion conductivity

### Technical Issues

Currently, it has several challenges to overcome :

1. Need thin and light form-factor for mobile devices
2. Cost of overall device is higher than battery
3. Need innovation in capacitive materials for charge storage performance
4. Surface engineering of materials for one or two dimensional ion transport for charge efficiency

### Expected Deliverables

The following is open to discussion:

- Suggestion of new materials or new structure
- Detailed progress reports every 3 months summarizing accomplishments.
- Prototype samples
- Patents with Samsung (if agreed)