Enhanced rate capability of hybrid capacitors in terms of electrode density of graphite

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Supercapacitors are of practical interest owing to their high power density and exceptionally long cycle life. Also, it has been used and developed such as memory back up for electric home appliance and information transport devices, renewable energy and power assist for transportation and machinery, voltage sag and renewable energy sources for stable electric power. Significantly, electric double layer capacitor (EDLC) consist of stacked activated carbon shows superior high power characteristics whereas it has low energy density as a drawback. Therefore, hybrid capacitor is one of possible candidates and is developing for high energy density.

The hybrid capacitor is made up with activated carbon electrode for electric double layer capacity and anode for intercalation and deintercalation of lithium ions. Although it shows inevitable increase of energy density [1-3], the total output power is lower than that the EDLC due to chemical reaction on the anode. To increase the power density, the decrease of intercalation length for low diffusion resistance is necessary. The hybridization of activated materials with carbon nanotubes, carbon nanofiber, and graphene is intriguing for the application of highly conductive cathode electrode.

Here, we introduce the preparation of carbon electrodes to enhance the output power on the anode without high-dimensional and high cost method. In general, high density electrode has high power characteristics because of low contact resistance. However, in this study, the decrease of electrode density can be increase dramatically the output power in the high current density. This result may give rise to the decrease of diffusion resistance due to the low electrode density and the stable surface electrolyte interface (SEI) at the reacting surfaces.

References

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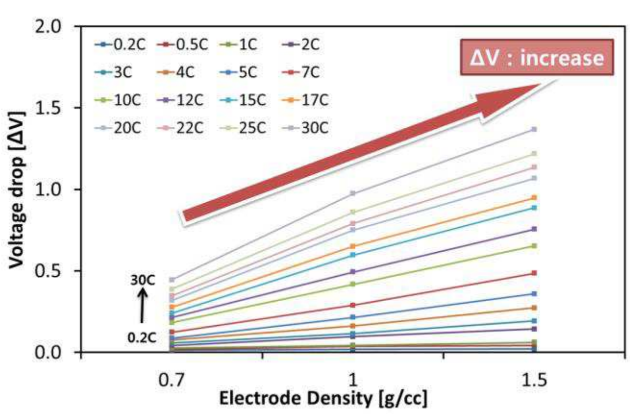

Figure. Voltage drop at discharge rate capability of various electrode density on graphite