Abstract Submitted
for the PSF14 Meeting of
The American Physical Society

Improving Capacitances and Supercapacitors with Metal-Organic Frameworks JAE JUNE LEE, KYUYEOL KIM, RICHARD KYUNG, Choice Research Group — If the space between the plates of a capacitor is filled with an insulator, the capacitance of the capacitor will be improved. A supercapacitor can hold hundreds of times more electrical density than a standard capacitor. In this research, we considered two cases of capacitors to improve capacitances in the electric device. First, considering the effective capacitance of a capacitor filled with multiple slabs of dielectrics with different dielectric constants, we showed the influence of the multiple dielectric slabs inserted in one capacitor on the electric field distribution in the capacitor system. Also changing energy stored in the capacitor is observed when the dielectric slab is withdrawn from the capacitor. And second, this study shows how metal-organic frameworks (MOFs) in the supercapacitors can be incorporated into electrical devices to generate high capacitance; in particular, a MOF with a transitional metal exhibits exceptionally high capacitance and charge/discharge cycles.

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Date submitted: 15 Nov 2014 Electronic form version 1.4