# Effects of Carbon Porosity on Sorption Applications; $CO_2$ adsorption, Capacitive Deionization, and Supercapacitor

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The increasing demands for portable power source including the electric vehicles have accelerated the attention for high power energy application such as supercapacitors. In addition, the numerous efforts to fulfill the advanced water purification have been conducted due to the water shortage and distribution issues. Capacitive deionization (CDI) is regarded as the next-generation technology using the capacitive behavior on the electrochemically charged electrode. Porous carbons are usually chosen as the electrode materials of electrochemical energy and environmental system. They also have received significant interests for the capture of $CO_2$ due to their unique pore-structure properties. Understanding the relationship between the porosity of carbons and their sorption performance enables the improvement of the system efficiency. In this study, porous carbons with similar specific surface area, which have a different porosity that can act as a channel for effective ion transport, were prepared by activating rice husks. These porous carbons were applied as an electrode material of supercapacitor and capacitive deionization, and also evaluated their performance on the physical sorption of $CO_2$. The sorption performance including capacity, kinetics and stability were improved by the developed mesopores of electrode material. The detailed correlations between the porosity of carbons and the performance in the system using ion adsorption and desorption will be discussed in this conference.