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Study on the Energy Density in Plate Capacitor Systems JUNG HYUN LEE, LUTHER LU, SOO YOUNG KANG, Choice Research Group — A capacitor, designed to store electrical charge, can have a range of capacitance depending on different factors. This study examines the behavior of a capacitor subject to various combinations of dielectric connections. The motivation for this research stems from recent studies that have shown the effectiveness of dielectric capacitors, reaching record-high energy storage surpassing that of batteries. This demonstrates that dielectrics allow a capacitor to store more charge with the same supplied voltage. By using mathematical models, we can evaluate the effect of the dielectrics on a capacitor's capacitance and determine the adjustment to the electric field distribution of the system. We have solved systems for parallel and perpendicular dielectric composites, deriving both power and equivalent capacitance for an infinite connection of capacitors. Furthermore, computer simulations will integrate data such as the capacitor system's area, thickness, material properties, and dielectric permittivity to more accurately depict the system. Studying these dielectrics may significantly reduce the size and energy consumption of capacitor systems.

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