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Hörsaal für Physik

"Novel and Hierarchical Carbon Nanomaterials for Energy-Related Applications"

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This presentation will describe the material aspects of supercapacitor development, address unresolved issues, and outline future research directions. High surface area carbon materials are widely used as supercapacitor electrodes. Extraction of metals from carbides can generate a broad range of potentially important carbon nanostructures, which range from porous carbon networks to onions and nanotubes. They are known as Carbide-Derived Carbons (CDC) and their structure depends on the crystal structure of the carbide precursor as well as process parameters, including temperature, time, and environment. *Via* dry halogenation of various binary and ternary carbides, micro- to mesoporous carbons with precisely controlled porosity and high specific surface areas of up to 3100 m^2/g can be obtained. However, CDC supercapacitors are usually limited to moderate scan rates, hence, prohibiting device performance at very high charge/discharge rates. The talk will provide an overview on strategies to overcome such limitations by creating carbon hybrid materials and by employing novel carbon nanomaterials such as onion-like carbon and MXene. Most importantly, the aspect of electrode architecture and design of binderfree, freestanding, and hierarchical porous electrodes will be discussed.