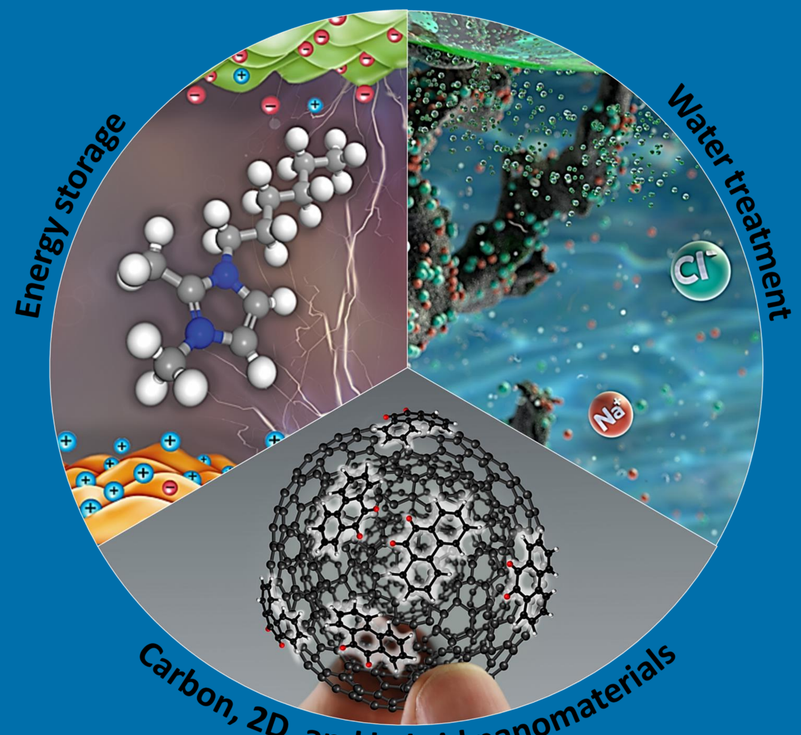
Energy Materials: New Materials and Technologies for Energy Storage & Water Remediation

At the **INM Energy Materials Group**, we synthesize, characterize, and apply nanomaterials for **energy storage** (*supercapacitors, batteries*) and **water treatment**. We use various synthesis methods, including hydrothermal synthesis, chemical and physical vapor deposition, and wet chemistry. **Carbon nanomaterials** and **nanohybrids** are the most important electrode materials. Hybridization of carbon is accomplished by implementation of nanosized metal oxides, and we also investigate **two-dimensional materials**, such as transition metal carbides (MXene) or transition metal dichalcogenides. **Redox electrolytes** capitalize on the rapid charge transfer when in nanoconfined; utilized as nanoreactors, nanoporous carbons combined with redox electrolytes enable the unique combination of battery-like energy storage while maintaining supercapacitor-like charge/discharge rates. Our team employs an array of characterization techniques (e.g., X-ray diffraction, electron microscopy, Raman & infrared spectroscopy) and **in-situ methods** to gain novel insights into electrochemical processes.



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- **Multidisciplinary & international team**
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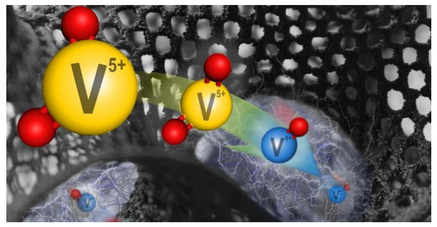
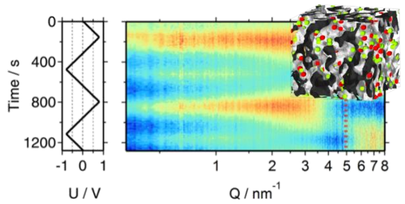
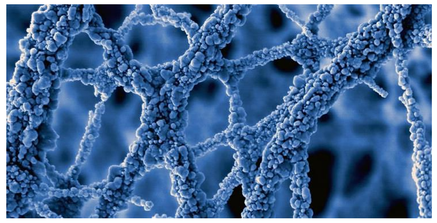
Electrochemistry



In situ technology



Nanomaterials synthesis



Electrochemical benchmarking