**Abstract**

**Title: Functional electrochemical interfaces to address Energy Storage and CO2 capture**

The rising demand for energy storage and environmental sustainability has led to the growing interest in functional materials for energy storage and carbon capture technologies. In energy storage, supercapacitors (SC) have attracted lots of attention due to their long cycle life, low maintenance, and simple operation. These devices fill the gap between batteries and conventional capacitors in terms of energy and power density. While most studies focus either on improving carbon-based materials or inorganic compounds, a more promising approach is to combine electrical double-layer capacitance (EDLC) with pseudocapacitive materials in composite forms, to leverage their advantages in a cost-effective way.

On a different topic, the anthropogenic release of CO2 in the atmosphere is one of the causes of rising temperatures and global climate changes. One way to mitigate this issue is CO2 capture and containment. Various technologies are being investigated, including redox-active organic molecules, electrochemically mediated amine regeneration, and inorganic chemisorbents­.To address the large energy costs of these techniques, an interesting approach is to develop a reversible system that is less energy intensive, using an electrostatic charge transfer mechanism at electrode interface to capture and release CO2 as a function of potential.

This talk will discuss 1) the design and engineering of the surface chemistry of carbon materials for improved capacitive charge storage in SCs, and 2) the in-situ changes of adsorbed species at electrochemical interface to tackle the question of reversible electrochemical CO2 capture and release.