NM6626 Polymer Electronics (TUM)

This course will focus on fundamentals of electronic and optoelectronic devices and technologies based on polymer semiconductors. Organic electronic technology uses new semiconductor materials based on carbon compounds such as organic small molecules or polymers. These materials can be chemically synthesized to tailor a variety of their semiconducting properties making them appealing for applications that require luminescence (LEDs), transport and charge mobility (transistors), the absorption of light (photovoltaic cells), and the modulation of such properties due to external stimuli (e.g., photodetectors, gas and pressure sensors). In addition, these materials are mechanically flexible and have also the intrinsic ability to be deposited over large areas on both rigid and flexible substrates by printing techniques (for polymers soluble in organic solvents) including ink jet or screen printing. This is why this field is also referred to as plastic or printed electronics. In particular, the course will address the following topics: Polymer electronics: an overview. Electronic structure and band theory. Beyond polyacetylene. Optoelectronic properties. Charge transport. Synthesis and macromolecular design. The physics of polymers. Surfaces and interfaces. Polymer transistors. Optoelectronic devices. Photovoltaic devices (organic and dye sensitized solar cells). Polymeric memories.