BIAN derived high-capacity anodes in lithium-ion secondary batteries

Chapter 1:

Energy is the key factor that governs technological progress. So far fossil fuels have been highest supplier of energy to satiate our day-to-day needs. However, the adverse ecological effects and the lack of renewability led to the exploration of various other sustainable energy sources. In this context, lithium-ion secondary batteries are attractive devices in terms of power and energy densities. Anode is a crucial component of lithium-ion batteries. In this thesis, the synthesis and electrochemical application of BIAN based polymers and N-doped carbon derived from BIAN based polymers in lithium-ion batteries are presented.

Chapter 2:

Organic polymers are materials with strong covalent bonds and possess the possibility of crosslinking between the organic moieties with different geometries. Organic polymers offer a distinct advantage of integrating multiple redox sites, tunable porosity, and relatively high surface area. In this chapter, the synthesis and anodic applications of imine and azo functionalized BIAN-Bismarck brown based conjugated organic polymer (BBP) are presented.

Chapter 3:

The charge storage properties of organic polymers can be enhanced by increasing the density of redox active groups. In this chapter, the synthesis and applications of Bis-imino-acenaphthoquinone (BIAN)-melamine based organic polymer (PBM) as an anode material in lithium-ion battery is presented.

Chapter 4:

Increasing the density of redox active sites by introducing hetero atoms and reducing the lithium diffusion length by generating porosity are enticing strategies to increase the fast-charging ability of anodes. In this chapter, synthesis, and application of N-doped carbon (Py PBM) derived from BIAN-melamine organic polymer as single source of carbon and nitrogen, as anodic active material was presented.

Keywords: Organic anode, n-type conjugated polymers, fast charging, BIAN, N-doped carbon.