With an ever increasing demand for mobile energy storage, advancing lithium ion batteries (LIBs) towards higher power and energy density is a key issue in science. One of the major bottlenecks for higher performance LIBs is the commercially used anode material graphite, which exhibits only a relatively low capacity. Therefore, searching for novel anode materials with improved performance has become a main focus of worldwide materials research.

Proposed polish-german project aims to develop new class of materials based on carbon spheres decorated with different guest molecules for anodes as a part of next generation lithium ion batteries. We focus on functionalization of conversion electrode materials which show particularly high capacity for energy storage. These potential electrode materials will be converted into actual energy storage materials by functionalization as carbon-based nanohybrids. Major development rules are (i) Nanoscaled conversion materials; (ii) Carbon nanostructures forming a conducting network which is stable upon electrochemical cycling; (iii) Strong interaction with or encapsulation of the active materials to the carbon structure in order to ensure electrical contact to the active material to conductive network even upon disintegration of the materials.

The project demands expertise in the fields of materials science, chemistry, and physics so that the interdisciplinary approach is required. There are clear benefits for both partners as neither of the teams can reach the tasks alone. We hence suggest to combine the particular strengths of the Polish team in synthesis and investigation of carbon nanomaterials and its composites with a well renowned expertise in the investigation of electrochemical and physical properties of novel materials by the German team. We believe that with our approach we can move forward to explore new class of materials with interesting electrochemical properties useful for anodes in LIBs.