The quest for green and sustainable energy storage systems has brought about the need for a material system that can satisfy the following requirements: low cost of production, environmental benignity, flexibility, redox stability, renewability and structural diversity. Interestingly, organic batteries have been identified as potential candidates to proffer solutions to the above-mentioned challenges.

One of the major challenges of organic battery is the lack of suitable positive electrode materials that can fulfil the requirements of conventional Li-ion batteries: Li-containing and air-stable. The thesis mainly developed two new organic Li-ion cathode chemistries, which are the conjugated sulfonamides and the conjugated oximates. The proposed organic cathode chemistries show high redox potential (> 3V vs. Li⁺/Li), good air-stability (oxygen and moisture stable), as well as excellent cycling performance as positive electrode materials in Li-ion batteries.