

# Advanced Binder Designs for High Capacity Electrode Materials

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It is found that polymeric binders play a critical role for stable operation of high capacity battery electrodes such as silicon (Si) anodes. Binder could stabilize the electrode films even during the large volume change of active material based on Si-binder and binder-binder interactions. In this talk, I will present recent binder designs from my research group focusing on supramolecular interactions. The supramolecular interactions facilitate self-healing process so that even though the original Si-binder interactions are lost during the volume expansion of active material, the integrity of the electrode can be maintained. Such binder designs include multi-dimensional cross-linkable hydrogen bonding networks [1], polymer networks based on ion-dipole interactions [2], host-guest interaction network [3], and elastic binder networks incorporating molecular machines, namely, polyrotaxanes [4]. I will also introduce an amphiphilic binder design targeting Si-carbon blended electrodes inspired by human organ structures. The series of the case studies indicate the usefulness of supramolecular interactions in designing polymeric binders that can maintain the battery electrodes with large volume variations.

## **References:**

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