

### Application of polypyrrole to lithium-ion battery as water-based polymer binder

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In recent years, the binder used for LIB anodes are appealed to possess a high adhesion strength and processability with environmentally friendly manufacturing process. Therefore, water-based polymers have attracted much attention these days. A high adhesive polymer would have a close connection between collectors and active material, and as well as among active material. Meanwhile, a good conductive binder can give more electrons paths, ultimately leading to better cycling and high-rate performance. In this study, we are going to introduce electronically-conductive polypyrrole combined with a high adhesive water-dispersed binder, poly(acrylonitrile-butyl acrylate)(P(AN-BA)). This is synthesized by two-step polymerization and is used as a anodic binder of lithium-ion battery. The electrochemical characteristics of the binder material is tested using  $\text{Li}_4\text{Ti}_5\text{O}_{12}$  (LTO) electrodes, because the LTO has low electrical conductivity even though its cycle performance is relatively stable, compared to typical graphite anodes. Physical properties of the binder material are also carefully examined through a variety of characterization techniques.