Highly ionically conductive polymer binder for lithium-ion batteries

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From cell phones to artificial organs and from electric vehicles to space shuttles, batteries have become an indispensable technology in the modern society. Since the electronics field is rapidly evolving, long cycle life and high energy density are key requirements in the battery area. One approach to propel the battery into the next level is to improve its electrode binder which in turn can increase the battery's lifetime and its performance overall. There have been many attempts in development of advanced binders. For example, one of the attempts includes electrically conductive polymer binder for lithium ion battery electrode which utilizes carboxylic acid functional group. In this study, we report a highly ionically conductive polymer binder that has been designed and synthesized to be used in the fabrication of cathode active material. We demonstrate the electrochemical performance of $LiNi_{0.8}Co_{0.15}Al_{0.05}O_2$ (NCA) cathode as its application. As results show, the ionically conductive binder with NCA cathode exhibits excellent cycle life as well as superior rate capability.

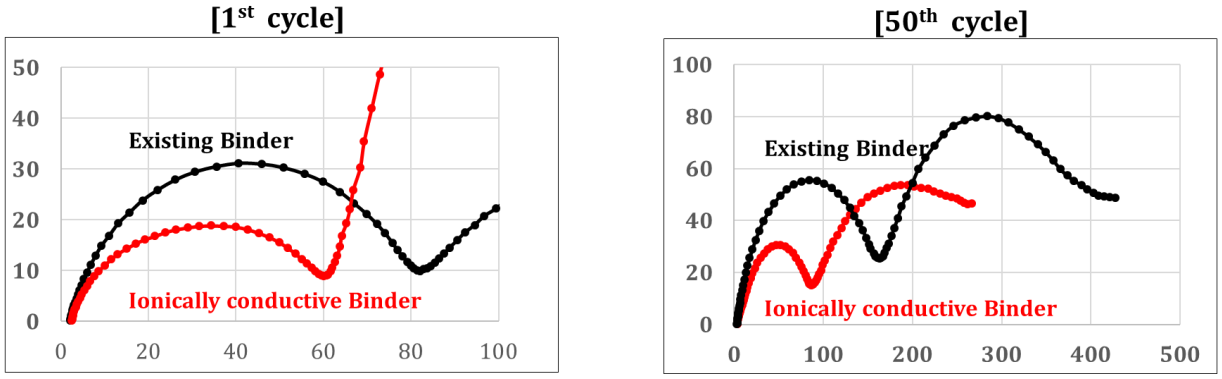

Figure 1. Electrochemical Impedance Spectroscopy (EIS data) after 1st cycle, 50th cycle. As can be seen, ionically conductive binder shows less electrode resistance.

References:
[1] Science 357, 279-283 (2017)
[2] ACS Nano, 10, 3702-3713 (2016)
[3] US 6,576,372 B1 (2003)
[4] US 9,153,353 B2 (2015)