Effect of pH on the rheology and microstructure of aqueous cathode slurry system based on poly (acrylic acid)

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Processing of water based Li-ion battery electrode has attracted attention due to its low cost and advantages in environmental issues compared to NMP based processing. Poly (acrylic acid) (PAA) has been attracted as a binder and dispersant for aqueous battery slurry due to low cost and availability in industry. In this study, we prove that the neutralization degree has a crucial effect on the dispersion stability of the slurry. Rheological properties of the slurry were measured and coupled with average agglomerate size at each pH. Surprisingly, dramatic change of microstructure and rheology was observed at pH=7. Liquid like behavior was shown at pH=6.0 while gel-like behavior was observed at pH=8.0. Optical microscopy, sedimentation test and agglomerate size showed same tendency. Abrupt transition is attributed to increased adsorption amount of PAA on the particle surface. PAA's charge density changed largely with pH, which varies the interaction. The results imply that a subtle difference in pH results in a notable influence on the rheological properties and dispersion stability, which are directly related with production of homogenous electrode.