

# Particles and Binder Interaction in the Lithium-ion Cell Electrodes

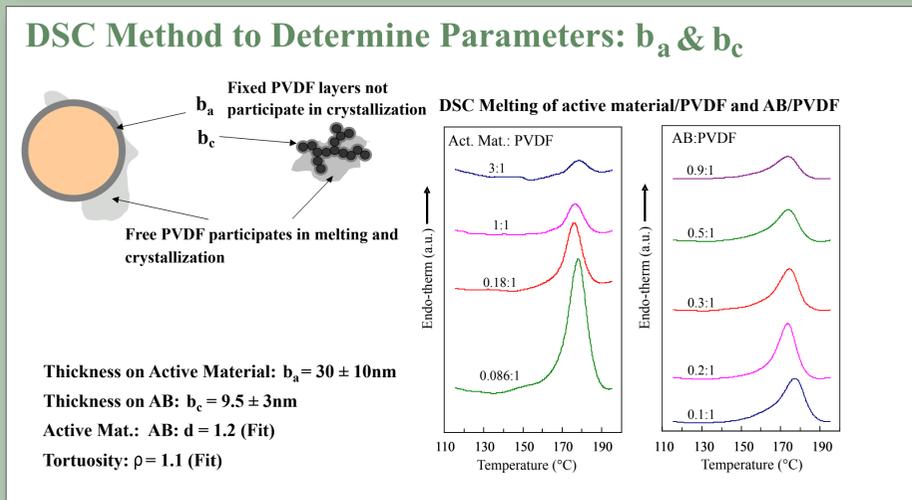
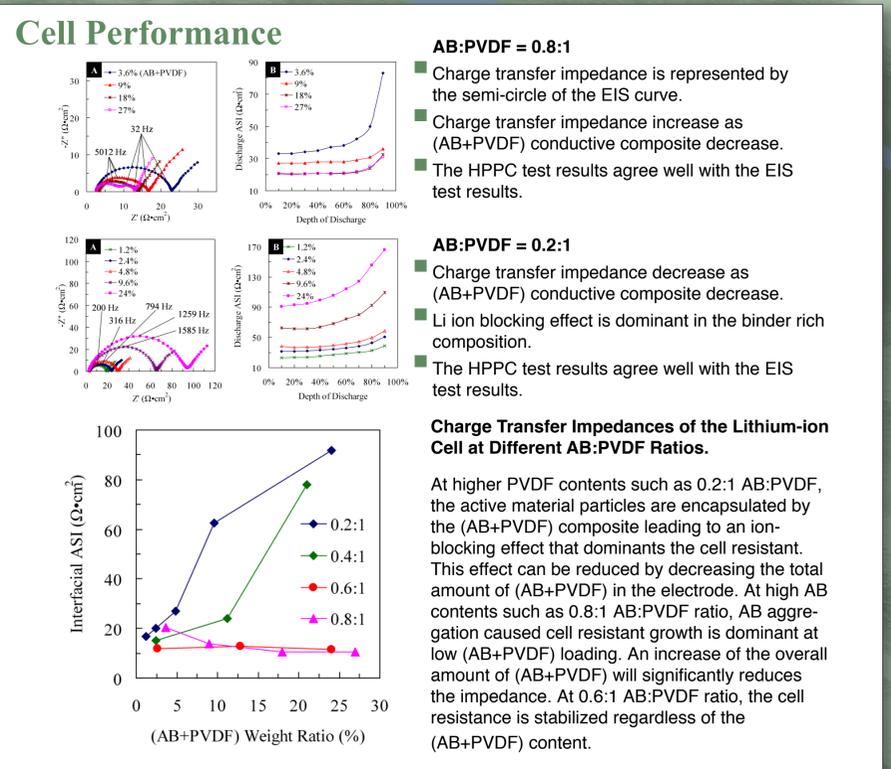
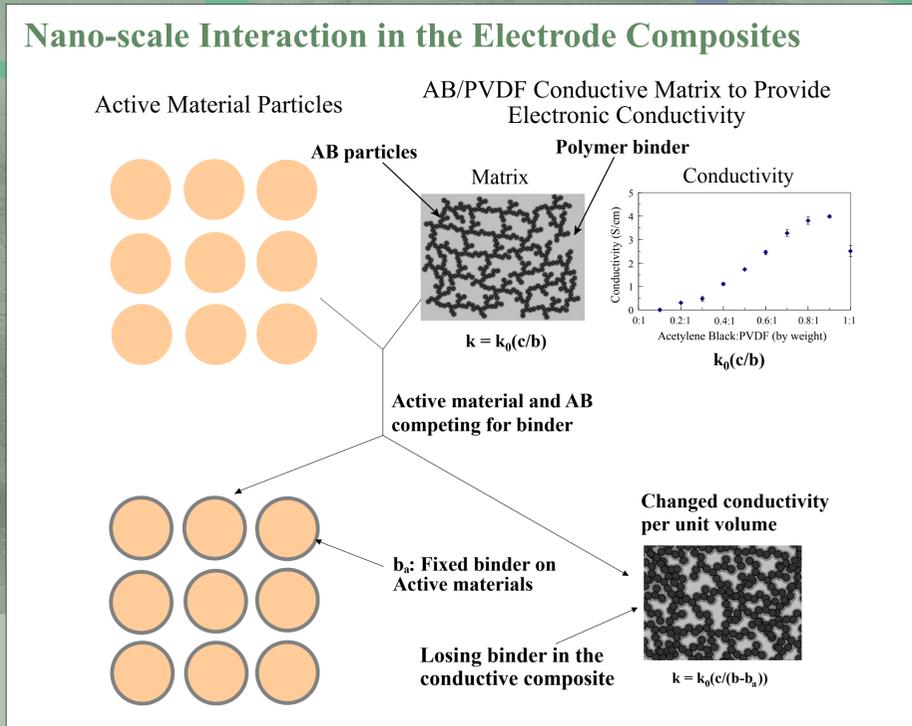
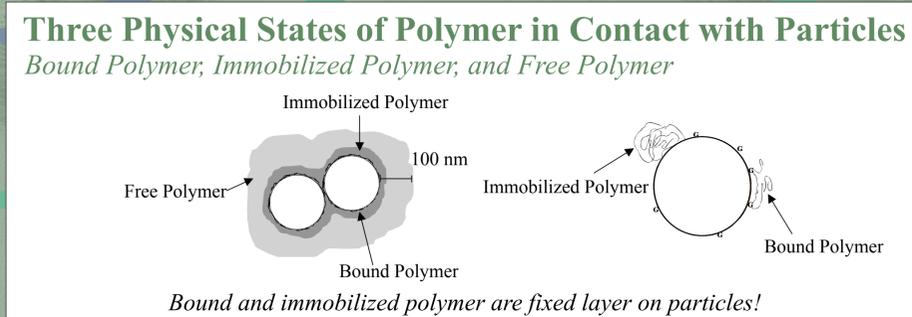
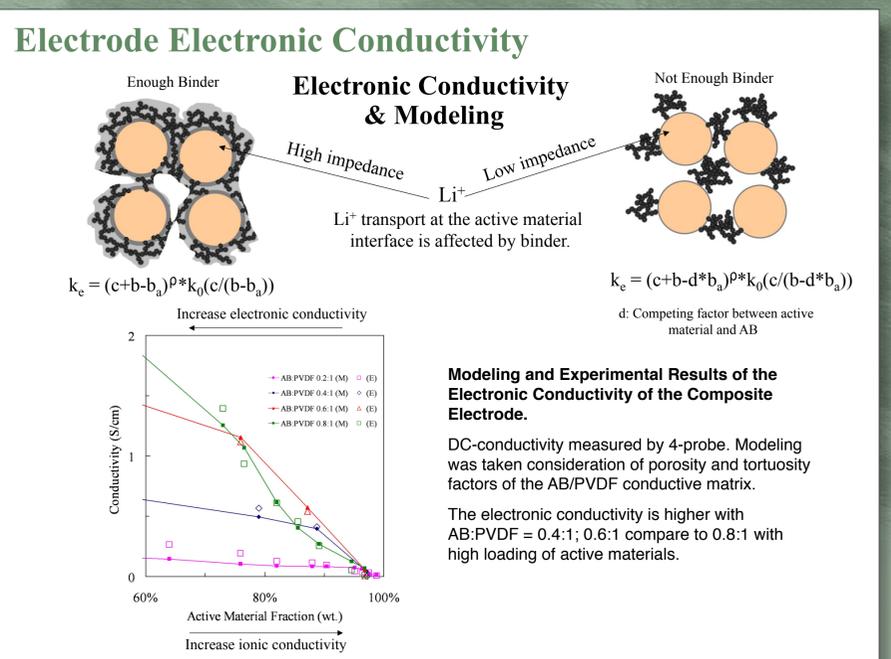
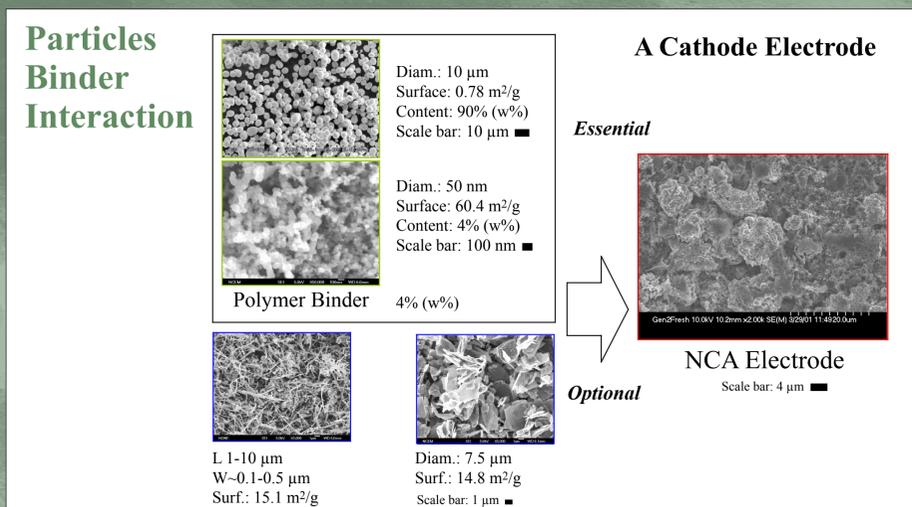
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**Introduction** Proper electrode design is critical to meet high power performance requirements for lithium-ion rechargeable battery applications. Binders and conductive additives, although not electrochemically active, are essential components in the electrodes. In a simple three component cathode system where polyvinylidene difluoride (PVDF) is used as a binder, along with

active material and acetylene black (AB) conductive additive, the dominant interaction between polymer and active material or polymer with AB changes proportionately with particle surface area. The PVDF binder interaction with the active material and AB on the micro or nano-scale plays an important role in determining the battery performance.



## Conclusions

- Binder plays critical roles in the composite electrode for providing not only mechanical integrity, but also electronic conductivity.
- The competition for binder between the active material and acetylene black is a fundamental factor affects cell performance.
- High acetylene black content such as AB:PVDF = 0.8:1 tends to produce electrode with lower electronic conductivity at high active material loading, but tend to exert minimum Li ion blocking.
- Intermediate acetylene black content such as AB:PVDF = 0.6:1 tends to produce electrode with higher electronic conductivity at high active material loading, with constant low Li ion block effect.

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