

## ABSTRACT

## Diffusion-Like Rate Distributions from Non-Diffusion Mechanisms in Battery Agglomerate Particles

The kinetics that control the capacity utilization of battery agglomerate particles (such as those of Lix(Ni,Mn,Co)O2) is typically interpreted as a series of charge transfer followed by solid-state chemical diffusion. This diffusion process makes different depths of the particle accessible at different time scales. For example, the particle mass near the reaction site is accessible at a faster rate, whereas the particle mass further away from the reaction site is accessible at a slower rate. Diffusion is a process where the capacity distribution increases towards lower rates, and it is this character that results in what we recognize as unique signatures for diffusion: polarization vs time1/2; or, impedance vs frequency-1/2. Conversely, whenever we observe such behavior, it is typically attributed to a chemical diffusion process. Here, we show that the kinetics of typical battery agglomerate particles do not behave according to this conventional idea. We demonstrate experimental situations where this interpretation breaks down. We further demonstrate through a porous agglomerate particle model that diffusion-like signatures can appear without any diffusion processes whatsoever.