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A new approach to Li-ion battery modeling

Most models of lithium-ion batteries follow the one-dimensional analysis approach. The major drawback of this is that the porosity and liquid-phase salt transport and solid-phase electronic conductivity are not explicitly resolved and the diffusion of lithium into and out of solid is modeled using representative spherical particles assuming perfect symmetry. These modeling assumptions limit the achievable accuracy; refinement of spatial computational grid and time steps cannot overcome the modeling error introduced by the above assumptions.

Researchers at Battery Design LLC and CD-adapco set out on a new approach, one that would avoid the limitations of the standard approach by resolving the structure of the electrode and explicitly modeling the transport of lithium in the electrolyte and solid phases. The following factors motivated the researchers to go down this path.

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CD-adapco (www.cd-adapco.com [3]) is the world's largest independent CFD focused CAE provider. Our core products are the technology-leading simulation packages, STAR-CCM+ and STAR-CD. The scope of our activities, however, extends well beyond CFD software development to encompass a wide range of CAE engineering services in fluid dynamics, heat transfer and structural engineering. Our ongoing mission is to "inspire innovation and reduce

costs through the application of engineering simulation software and services."

A privately owned company, CD-adapco has maintained 17% organic year-on-year growth over the last 5 years. CD-adapco employs 700 talented individuals, working at 30 different offices across the globe.

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CD-adapco is the world's largest independent CFD focused provider of engineering simulation software, support and services. We have over 30 years of experience in delivering industrial strength engineering simulation.

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