



Deutsches Zentrum
für Luft- und Raumfahrt

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Einladung zum Institutskolloquium TT

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Thema: Model-Based Design of Next-Generation Zinc-Air Batteries

Zinc-air batteries (ZABs) with aqueous electrolytes are among the most promising post-lithium technologies currently in development. They are based on abundant materials, can achieve high energy density, and have superior operational safety. Unfortunately, both the cycling stability and calendar lifetime of ZABs are limited.

Traditional ZABs are based on alkaline KOH electrolytes. The high conductivity and moderate Zn solubility of KOH makes it ideal for primary batteries, but it introduces some challenges to rechargeable systems. When exposed to air, dissolved CO₂ can react with KOH to form potassium carbonates. This parasitic reaction blocks pores in the air electrode, lowers the conductivity of the electrolyte and slows down reaction kinetics. Furthermore, Zn deposition in KOH is known to take on dendritic or mossy morphologies, causing the Zn electrode to change shape as the cell is cycled. For ZABs to fulfill their potential as rechargeable batteries, these challenges must be addressed.

This talk presents the design of next generation Zinc-Air batteries, considering everything from fundamental thermodynamics to cell architecture engineering. It is shown how thermodynamic considerations can help evaluate new electrolyte materials and improve our understanding of these complex and promising batteries.

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