On a Mathematical Model of Lithium/Air Batteries

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Abstract: Lithium/air batteries recently attract great attention of many engineers and mathematicians. Different mathematical models have been proposed to understand the electrochemical properties of these new devises and to prolong their lifetime. In this talk, a diffusion limited model for a lithium/air battery with an organic electrolyte is studied and the problem of maximizing the cathode capacity during discharge by optimal positioning of the catalyst along the pore of the porous cathode is investigated. The mathematical model leads to a system of coupled partial differential equations, the well-posedness of which is proved by the fixed-point method. The problem of optimal positioning of the catalyst is reformulated as an optimal control problem in an admissible set of the catalyst functions, and the Fréchet differentiability of the objective functional is proved via a sensitivity system. Some numerical simulations are presented for illustrating the theoretical results.

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