

Reduced Order Model Compensator Control of Species Transport in a CVD Reactor

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Abstract

We propose the use of proper orthogonal decomposition (POD) techniques as a reduced basis method for computation of feedback controls and compensators in a high pressure chemical vapor deposition (HPCVD) reactor. In this paper, we present a proof-of-concept computational implementation of this method with a simplified growth example for III-V layers in which we implement Dirichlet boundary control of a dilute Group III reactant transported by convection and diffusion to an absorbing substrate with no reactions. We implement the model-based feedback control using a reduced order state estimator based on observations of the flux of reactant at the substrate center. This is precisely the type of measurements available with current sensing technology. We demonstrate that the reduced order state estimator or compensator system is capable of substantial control authority when applied to the full system. In principle, these ideas can be extended to more general HPCVD control situations by including multiple species with gas phase reactions and surface reactions.