

Abstract Submitted  
for the DFD08 Meeting of  
The American Physical Society

**Constructing Slow Invariant Manifolds for Reactive Systems with Detailed Kinetics**<sup>1</sup> ASHRAF N. AL-KHATEEB, JOSEPH M. POWERS, SAMUEL PAOLUCCI, ANDREW J. SOMMESE, JEFFREY A. DILLER, JONATHAN D. HAUENSTEIN, JOSHUA D. MENGERS, University of Notre Dame — Rational reduction of reactive systems becomes possible when their Slow Invariant Manifolds (SIMs) are identified. In this work, a robust method of constructing the one-dimensional SIMs for unsteady spatially homogeneous reactive systems is presented. The method is based on global analysis of the composition phase space of the reactive system, where all critical points, finite and infinite, are identified using a projective space technique. Then by connecting these equilibria via trajectories, the SIM can be characterized. Employing the projective space technique offers the possibility to construct SIMs for detailed kinetic systems (*e.g.*  $H_2$ -*Air*). Moreover, the relation between reactive systems dynamics and the thermodynamics is examined, and it is shown that classical thermodynamics potentials cannot identify the SIM.

<sup>1</sup>NSF #0650843

Samuel Paolucci  
University of Notre Dame

Date submitted: 01 Aug 2008

Electronic form version 1.4