Generalized law of mass action (LMA) with energetic variational approaches (EnVarA) and applications

We will present a derivation and generalization of the mass action kinetics of chemical reactions using an energetic variational approach. The dynamics of the system is determined through the choice of the free energy, the dissipation (the entropy production), as well as the kimenatics (conservation of species).
The method enables us to capture the coupling and competition of various mechanisms, including mechanical effects such as diffusion, viscoelasticity in polymerical fluids and muscle contraction, as well as the thermal effects. We will also discuss several applications such as the modeling of wormlike micellar solutions. This is a joint work with Bob Eisenberg, Pei Liu, Yiwei Wang and Tengfei Zhang.