1172-35-169 **Yiwei Wang*** (ywang487@iit.edu), **Teng-Fei Zhang** (zhangtf@cug.edu.cn) and **Chun Liu** (cliu124@iit.edu). *On a micro-macro model for a reactive complex fluid: an energetic variational approach.*

In this talk, we present a thermodynamically consistent two-species micro-macro model of a reactive complex fluid in which polymer chains can break and combine reversibly, known as wormlike micellar solutions, by employing an energetic variational approach. The model incorporates a breakage and combination process of polymer chains into the classical micro-macro dumbbell model of polymeric fluids in a unified variational framework. The modeling approach can be applied to other reactive or active complex fluids. Different maximum entropy closure approximations to the new model will be discussed. By imposing a proper dissipation in the coarse-grained level, the closure model, obtained by "closure-then-variation", preserves the thermodynamical structure of both mechanical and chemical parts of the original system. The resulting model is an Oldroyd-B type system coupled with a chemical reaction. We'll also present the dynamic stability analysis on the micro-macro model. In particular, we show the global existence of classical solutions near the global equilibrium, which indicates the consistency between the detailed balance conditions in a chemical reaction and the global equilibrium state of each species. (Received August 25, 2021)