UNCONDITIONAL ENERGY STABILITY AND SOLVABILITY FOR A C0 INTERIOR PENALTY METHOD FOR A SIXTH-ORDER EQUATION MODELING MICROEMULSIONS

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ABSTRACT

In this talk, we present a continuous interior penalty Galerkin method for solving a certain class of sixth-order Cahn-Hillard type equation which models the dynamics of phase transitions in ternary oil-water-surfactant systems. We express this nonlinear sixth-order parabolic equation in its mixed form as a system consisting of a second-order (in space) parabolic equation and an algebraic fourth-order (in space) nonlinear equation. We choose a time discretization so that a discrete energy law can be established leading to unconditional energy stability. Furthermore, we show that the numerical method is unconditionally uniquely solvable. We close the talk by presenting the numerical results of some benchmark problems to verify the practical performance of the proposed approach and discuss some exciting current and future applications including adaptive time-stepping strategies which seek to resolve the different time scales that arise in the interfacial dynamics of the system.

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