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Global Existence for a Singular Gierer-Meinhardt and Enzyme Kinetics System

In this talk we discuss the existence results for a singular system subject to zero Dirichlet boundary conditions, which originally arose in studies of pattern-formation in biology and chemical reactions in Chemistry. The mathematical difficulties are that the system becomes singular near the boundary and it lacks a variational structure. We use a functional method to obtain both upper and lower bounds for the perturbed system and then use Sobolev embedding theorem to prove the existence of a pair of positive solutions under suitable conditions. This method is first used in a singular parabolic system and is completely different than the traditional methods of sub and super solutions.