PIMS / AMI Seminar

Friday, April 7, 2017
3:00 p.m.
CAB 657

"Steady hydrodynamic model of semiconductors with sonic boundary"

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Abstract

In this talk, we consider the well-posedness, ill-posedness and the regularity of stationary solutions to the hydrodynamic model of semiconductors represented by Euler-Poisson equations with sonic boundary, and make a classification on these solutions. When the doping profile is subsonic, we prove that, the corresponding steady-state equations with sonic boundary possess a unique interior subsonic solution, and at least one interior supersonic solution; and if the relaxation time is large and the doping profile is a small perturbation of constant, then the equations admit infinitely many interior transonic shock solutions; while, if the relaxation time is small enough and the doping profile is a subsonic constant, then the equations admits infinitely many interior C^1 smooth transonic solutions, and no transonic shock solution exists. When the doping profile is supersonic, we show that the system does not hold any subsonic solution; furthermore, the system doesn't admit any supersonic solution or any transonic solution if such a supersonic doping profile is small enough or the relaxation time is small, but it has at least one supersonic solution and infinitely many transonic solutions if the supersonic doping profile is close to the sonic line and the relaxation time is large. The interior subsonic/supersonic solutions all are globally $C^{\frac{1}{2}}$ H\"older-continuous, and the H\"older exponent $\frac{1}{2}$ is optimal. The non-existence of any type solutions in the case of small doping profile or small relaxation time indicates that the semiconductor effect for the system is remarkable and cannot be ignored. The proof for the existence of subsonic/supersonic solutions is the technical compactness analysis combining the energy method and the phase-plane analysis, while the approach for the existence of multiple transonic solutions is constructed. The results obtained significantly improve and develop the existing studies.

This is a joint work with Jingyu Li, Guojing Zhang and Kaijun Zhang.

Refreshments will be served in CAB 649 at 2:30 p.m.