1092-35-146 **Oleksandr Misiats*** (omisiats@purdue.edu), Department of Mathematics, 150 N University str., West Lafayette, IN 47907, and **Michael Dos Santos** and **Petru Mironescu**.

Ginzburg-Landau model of composite superconductors with small superconducting inclusions.

This talk is devoted to some aspects of modeling composite superconductors. The work was motivated by the physical models of vortex pinning (i.e., fixing the positions of vortices), which is done by introducing inclusions into a homogeneous superconductor. Mathematically, composite superconductors are modeled via Ginzburg-Landau type functional with a piecewise constant pinning term a in the potential $(a^2-|u|^2)^2$, which takes two different values in the medium and in the inclusions. We study the minimization problem for such functional subject to Dirichlet boundary conditions with zero topological degree on the boundary. We obtain the homogenized description of Ginzburg-Landau minimizers in the limit of large number of inclusions and small ε (where ε is the inverse Ginzburg-Landau parameter). We next proceed with modeling a superconductor with finitely many small superconducting inclusions in the presence of vortices. We show that even the inclusions of vanishingly small size (e.g. shrinking to single points) capture the vortices of minimizers. This way we reduce the problem of finding the locations of the vortices to a discrete minimization problem for a finite-dimensional functional of renormalized energy. (Received August 07, 2013)