Meeting: 1000, Albuquerque, New Mexico, SS 11A, Special Session on Nonlinear Partial Differential Equations Applied to Materials Science

1000-35-43 **Jianzhong Sun*** (`jsun@math.purdue.edu`), Mathematics and Statistics Department, UNC at Wilmington, 601 South College Road, Wilmington, NC 28403, and **Patricia Bauman**. *Long-time Limit For The Ginzburg-Landau System With Pinning.* Preliminary report.

The inhomogeneous superconductor is analyzed within the framework of Ginzburg-Landau theory, where the state of the superconductor is described by the Gor'kov-Eliashberg system (TDGL system) with a parameter ϵ and a penalty function $a(x)$. We present a novel way to find long-time properties for the superconductor through the analysis of the gauge transformation equation, and show that the solution of the TDGL system converges to a static state under various gauges. By setting an appropriate gauge, the convergence is in $C^{2,\alpha}$ globally. When $a(x)$ has zero points in the domain, and the parameter ϵ is small enough, it is shown that the degree properties of the solution for the TDGL system resemble its initial value in a certain sense; moreover, the degree of the limit is the same as the degree of the initial value around a zero point of $a(x)$, which gives another way to analyze the degree properties for the static solution of the superconductor. (Received August 04, 2004)