

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Feasibility of Superconductivity in Semiconductor Superlattices

KENNETH P. WALSH, U. S. ArmyEnergetics, Pyrotechnic Research and Technology, ANTHONY T. FIORY, N. M. RAVINDRA, New Jersey Institute of Technology, DALE R. HARSHMAN, Physik Research Corporation, JOHN D. DOW, Arizona State University — The possibility of designing a semiconducting superlattice of alternating electron and hole layers that exhibits high temperature superconductivity is studied by numerical simulation of modulation-doped GaAs/Al_xGa_{1-x}As superlattices. The feasibility of superconductivity is based on observations of high-temperature superconductors by Harshman and Mills¹, who concluded that the mechanism for Cooper pairing is a Coulomb interaction that is optimum when the mean distance between charge carriers within the layers equals the distance between the layers. Superlattice design considers optimum layer spacings, doping concentrations, and alloy concentration, x. The program employed in the superlattice simulations is a one-dimensional Schrödinger-Poisson solver developed by Snider².

1. D. R. Harshman and A. P. Mills, *Concerning the nature of high-T_c superconductivity*, Phys. Rev. B 45, 707 (1992).
2. G. Snider, *1D Poisson/Schrödinger User's Manual: A Band Diagram Calculator*, (<http://www.nd.edu/~gsnider>, Univ. Notre Dame, Notre Dame, Indiana).

Anthony Fiory
New Jersey Institute of Technology

Date submitted: 29 Nov 2005

Electronic form version 1.4