Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Future device applications of low-dimensional carbon superlattice structures SOMNATH BHATTACHARYYA, Nano-Electronics Center, Advanced Technology Institute, University of Surrey, Guildford, GU2 7XH, United Kingdom — We observe superior transport properties in low-dimensional amorphous carbon (a-C) and superlattice structures fabricated by a number of different techniques. Low temperature conductivity of these materials is explained using argument based on the crossover of dimensionality of weak localization and electron-electron interactions along with a change of sign of the magneto-resistance. These trends are significantly different from many other well characterized ordered or oriented carbon structures, and, show direct evidence of high correlation length, mobility and an effect of the dimensionality in low-dimensional a-C films. We show routes to prepare bespoke features by tuning the phase relaxation time in order to make high-speed devices over large areas. The artificially grown multi-layer superlattice structures of diamond-like amorphous carbon films show high-frequency resonance and quantum conductance suggesting sufficiently high values of phase coherence length in the present disordered a-C system that could lead to fast switching multi-valued logic.

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Date submitted: 25 Jan 2005 Electronic form version 1.4