Preparation of 25 nm spaced PdAu metal electrodes on silicon by direct nanotransfer printing

Abstract:
Nanometer scale metallic contacts which can be directly deposited on planar substrates are of growing importance in view of future applications involving the integration of molecular electronics with current silicon technology. Here, a method which may provide well defined nanogap electrodes of predetermined spacing in a reproducible manner, without the need of sequential direct writing techniques, would be highly advantageous. We present a novel technique using direct high-resolution metal nanotransfer printing and demonstrate its capability to fabricate nanogap electrodes of predetermined spacing on a solid substrate such as silicon. The one-step transfer process is economical, simple and fast, and preserves the mold for manifold transfer. Using molecular beam epitaxy (MBE) a sandwich-like structure is grown with monolayer precision, comprising few nanometer thick GaAs layers embedded in AlGaAs. This structure is cleaved atomically flat perpendicular to the crystallographic direction. Subsequently, the exposed GaAs layers are wet chemically etched thereby generating a 3D grating structure with nanometer-resolution at their...
edges. This structure serves as mold for nanotransfer printing: By coating the grating surface with a metallic thin film of PdAu/Ti (7/5 nm) and pressing the mold against a Si/SiO2 substrate the patterned PdAu/Ti sandwich structure is directly transferred onto the surface. This one-step process does not require any flexible buffer layer or additional organic adhesion promoters. We report on a series of successful transfer experiments using different multi-line molds with varying aspect ratios and linewidths down to below 10 nm. In particular, we demonstrate electrically functional PdAu metal electrode pairs with separations down to 25 nm, featuring lead resistances of the order of kΩ and gap isolation in excess of 50 GΩ up to 2 Volts.

Kongress- / Buchtitel:
55th AVS International Symposium Nanomanufacturing Focus Topic Room: 309 - Session NM+EM+PS+NS+NC-ThM

Kongress / Zusatzinformationen:

Jahr:
2008

Quartal:
4. Quartal

Jahr / Monat:
2008-10

Monat:
Oct

Sprache:
de

WWW:
http://www2.avs.org/symposium2008/ProgramBooks/ProgramBook_Complete.pdf

Format:
Text

Occurences:
· Einrichtungen > Fakultäten > Fakultät für Elektrotechnik und Informationstechnik > Lehrstühle und Professuren > Nanoelektronik (Prof. Becherer komm.) > 2008

entries: