

UCLA Electrical Engineering ARR 2011

Session 4. Innovative Devices North Ridge Room

11:00-11:25

"Voltage-Induced Switching of CoFeB-MgO Magnetic Tunnel Junctions"

Juan G. Alzate, Pedram Khalili Amiri, Sergiy Cherepov, Jian Zhu, Pramey Upadhyaya, Mark Lewis, Ilya Krivorotov, Jordan Katine, Jurgen Langer, Kosmas Galatsis, and Kang L. Wang

Abstract:

We present voltage-induced switching of magnetic states in nanoscale elliptical magnetic tunnel junctions (MTJs). In this work, we demonstrated experimentally voltage-driven magnetization switching, assisted by magnetic fields, in a 190 nm by 60 nm structure by exploiting the voltage-controlled perpendicular anisotropy in ultra-thin ferromagnetic metallic layers. The two stable equilibrium states had an MR ratio ~15%, and the coercivity was 120 Oe. The measured quasi-static R-V curves demonstrate very low switching voltages of ~0.6 V for both directions of switching. This voltage-driven magnetization switching can be exploited in ultralow-power memory and logic applications.

11:25-11:50

"Nanowire Fabric Devices and VLSI Technology for Nanoarchitectonics"

Jorge Kina, Kyeong-Sik Shin, and Chi On Chui

Abstract:

Over the past few years, several unconventional circuit architectures based on nanoscale device fabrics have been proposed as an alternative to future generations of CMOS. One promising candidate is the Nanoscale Application Specific Integrated Circuit (NASIC), which is based on semiconductor nanowires and targeting data-paths with built-in fault resilience modules. The NASIC fabric is built on a 2-D semiconductor nanowire grid with crossed nanowire field-effect transistors (xnwFET) at selected crosspoints. Our research has been focusing on the experimental developments of xnwFET devices and fabric formation technology. In this talk I will present several device innovations as well as VLSI-ready fabric

manufacturing technology towards the demonstration of a fully functional NASIC prototype.

11:50-12:15

"CMOS-Compatible Surface-Micromachined RF-Relay"

Jere Harrison and Rob Candler

Abstract:

The search for increased isolation, reduced insertion loss, and improved system linearity has led to a great deal of academic and industry interest in RF-MEMS switches. Traditional semiconductor switches have isolation limited by capacitive coupling through the high dielectric constant semiconductor material, and the modulation of channel carrier density results in nonlinear channel conductance for large amplitude signals. RF-MEMS switches can directly address these limitations. A magnetically actuated waveguide can produce linear response with a free-space throw of several tens of microns, producing very high isolation. These devices can be fabricated with a low-temperature back-end CMOS-compatible process.