Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Single-Crystalline Germanium Nanowire Heterostructure for High-Performance Transistors and Spintronics[1] JIANSHI TANG, KANG L. WANG, Device Research Laboratory, Department of Electrical Engineering, University of California, Los Angeles, California, 90095, USA, CHIU-YEN WANG, LIH-JUANN CHEN, Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan, 30013, Republic of China — The formation of single-crystalline $Ni_2Ge/Ge/Ni_2Ge$ nanowire heterostructure and its field effect characteristics by controlled reaction between a Ge nanowire and Ni contacts were studied. Transmission electron microscopy (TEM) studies reveal a wide temperature range to convert the Ge nanowire to single-crystalline Ni_2Ge by a thermal diffusion process. The *in-situ* reaction examined by TEM shows atomically sharp interfaces for the $Ni_2Ge/Ge/Ni_2Ge$ heterostructure with good epitaxial matches of Ge[-110]//Ni_2Ge[0-11] and Ge(111)//Ni_2Ge(100). Field effect transistors (FETs) built on this nanowire heterostructure show a high-performance p-type FET behavior with an on/off ratio over 10^5 and a field-effect hole mobility of 210 cm^2/Vs. This nanowire heterostructure with atomically sharp interfaces opens an opportunity to achieve high-performance nanowire transistors and explore promising application in spintronics.

[1]The work was supported in part by FCRP-FENA (Functional Engineered Nano Architectonics)

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Date submitted: 27 Nov 2010 Electronic form version 1.4