

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Electrical Spin Injection and Detection in $\text{Mn}_5\text{Ge}_3/\text{Ge}/\text{Mn}_5\text{Ge}_3$ Nanowire Transistors¹ JIANSHI TANG, CHIU-YEN WANG, KANG L. WANG, Device Research Laboratory, Department of Electrical Engineering, University of California, Los Angeles, California, 90095, USA, LIH-JUANN CHEN, Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan, 30013, Republic of China — We report the electrical spin injection and detection in Ge nanowire transistors with single-crystalline Mn_5Ge_3 as the ferromagnetic source/drain contacts. The magnetoresistance (MR) of the $\text{Mn}_5\text{Ge}_3/\text{Ge}/\text{Mn}_5\text{Ge}_3$ nanowire transistor was found to be largely affected by the applied bias. Specifically, negative and hysteretic MR curves were observed under a large current bias from 2 K up to 50 K, clearly indicating successful spin injection into the Ge nanowire. In addition, the MR amplitude was found to exponentially decay with the Ge channel length. The fitting of MR further revealed a spin diffusion length of about 480 nm and a spin lifetime exceeding 244 ps at 10 K in *p*-type Ge nanowires, which are much larger than those reported for bulk *p*-type Ge. Our study of the spin transport in the Ge nanowire transistor points to a possible realization of spin-based transistors, and it may also open up new opportunities to create novel nanowire-based spintronic devices.

¹The work was supported in part by Western Institute of Nanoelectronics.

Jianshi Tang
Device Research Laboratory, UCLA

Date submitted: 15 Nov 2013

Electronic form version 1.4