Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Temporal evolution of spin diffusion lengths of Cu in nonlocal spin valves XIAOJUN WANG, HAN ZOU, YI JI, University of Delaware — Co/Cu nonlocal spin valves have been fabricated by shadow evaporation. The nonlocal spin signals have been measured every a few days over a 50-day-period after the fabrication of the devices. Unexpectedly, we found over 100% increase of the spin signals. By analyzing the data for multiple devices fabricated on the same chip, we found the room temperature spin diffusion length of the Cu increases from 300 nm to 350 nm. The spin diffusion length at 4.2 K increases from 540 nm to $\sim$ 600 nm. The spin polarization shows a modest increase from 9% to 11% during the first 10 days, and then stays at the same value. We believe the increased spin diffusion length is related to the natural oxidation of the devices. Furthermore, we propose that Co impurities are implanted near the two side surfaces of the Cu wire during the shadow evaporation. These impurities limit the spin diffusion lengths of Cu in the as-fabricated devices. The gradual oxidation of the Cu surfaces will also oxidize the Co impurities and thus reduce the rate of spin-flip scatterings. Work supported by U.S. DOE Grant No. DE-FG02-07ER46374.

Xiaojun Wang
the University of Delaware

Date submitted: 17 Nov 2009 Electronic form version 1.4