Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Magnetoresistance in an all-organic-based spin valve BIN LI, CHI-YUEH KAO, JUNG-WOO YOO, YU LU, MENGQI ZHOU, VLADIMIR PRIGODIN, ARTHUR EPSTEIN, The Ohio State University — We demonstrate spin injection and detection in an all-organic-based magnetic tunnel junction using two layers of organic-based magnet V[TCNE]$_x$ (x$\sim$2, TCNE: tetracyanoethylene) as the magnetic contacts and organic semiconductor rubrene ($C_{42}H_{28}$) as the spacer. For the V[TCNE]$_x$ film growth, we exploited two different growth techniques, chemical vapor deposition and molecular layer deposition, which result in different coercivities of V[TCNE]$_x$ films. The spin valve devices show negative magnetoresistance (MR), the sign of which does not change with temperature and bias. To explain the unusual negative MR, we propose a simple phenomenological bias-enhanced selective tunneling (BEST) model based on the different spin polarizations of the molecular energy levels of V[TCNE]$_x$. Our results show the significance of bias induced energy level shift in organic spintronic devices due to relatively narrow spin polarized bandwidths. This work was supported in part by AFOSR Grant No. FA9550-06-1-0175, DOE Grant Nos DE-FG02-01ER45931, DE-FG02-86ER45271, NSF Grant No. DMR-0805220, the Center for Emergent Materials (an NSF-MRSEC; Award Number DMR-0820414) at The Ohio State University and the Institute for Materials Research at The Ohio State University.

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Date submitted: 09 Nov 2011 Electronic form version 1.4