

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Organic **mul-**
tiferroic tunnel junctions with ferroelectric poly(vinylidene difluoride)
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Rico — Organic polymers, such as poly(vinylidene difluoride) (PVDF), form high
quality ordered layers and exhibit robust ferroelectricity down to a monolayer [1].
This property makes PVDF polymers promising as barriers in multiferroic tunnel
junctions (MFTJs) – devices which exhibit multiple resistance states associated with
different magnetization and ferroelectric polarization configurations [2]. In this work
we present first-principles calculations of the spin-polarized tunneling conductance
of crystalline Co/PVDF/Co(0001) MFTJs. Using the Landauer-Büttiker formal-
ism implemented within a plane-wave pseudopotential method we calculate spin-
resolved transmission for parallel and antiparallel magnetization of the electrodes.
Our calculations predict a negative spin polarization of the tunneling conductance
and a sizable tunneling magnetoresistance (TMR) in these junctions. Further efforts
are aimed at exploring the tunneling electroresistance (TER) effects in asymmetric
MFTJs where a monolayer of Au is deposited at one of the interfaces. Our results
indicate that organic ferroelectric materials may open a new promising direction in
organic spintronics. [1] A. V. Bune et al, *Nature* **391**, 874 (1998). [2] J. P. Velev et
al, *Nano Lett.* **9**, 427 (2009).

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Date submitted: 18 Nov 2009

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