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Cu metal/Mn phthalocyanine organic sprinter faces atop Co with high spin polarization at room temperature

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Spin polarized charge transfer between a ferromagnetic metal and a molecule can magnetize the molecule atoms and generate an interface with a high spin polarization of electronic states at the Fermi level at room temperature. Similarly, the Mn-phthalocyanine molecule's central paramagnetic site Mn can couple magnetically to a Co layer thanks to interlayer exchange coupling upon separating both interfacial constituents with an ultra-thin non-magnetic Cu spacer. However, the large spin polarization at the Cu/Mn-phthalocyanine sprinter face atop Co has so far only been predicted. We experimentally demonstrate this high spin polarization at room temperature through spin resolved photo emission spectroscopy measurements on the prototypical system Co (001)/Cu/Mn-phthalocyanine. Surprisingly, we find that the Cu thickness dependence of the spin polarization remains essentially constant up to 10 monolayers, which is inconsistent with the interlayer exchange coupling description of magnetic coupling between the Co layer and the molecule's Mn site. *Ab-initio* calculations account for this fundamental discrepancy by showing that the top most Cu layer before Mn-phthalocyanine adsorption is already significantly spin-polarized and contributes to the formation of the Cu/Mn-phthalocyanine sprinter face atop Co. We thus find that this example of a non-magnetic metal/molecule organic sprinter face atop a ferromagnet is advantageously impervious to variations in the non-magnetic metal layer thickness as expected from an interlayer exchange coupling description of its formation. Our results open a route toward integrating electronically fragile molecules within organic sprinter faces and electrically manipulating molecular spin chains using the well-documented spin-transfer torque properties of ferromagnetic metal/non-magnetic metal bilayers.

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Biography

Wolfgang Weber has completed his PhD at RWTH Aachen, Germany during 1988-1992. He has completed his Postdoctoral studies and worked as a Senior Scientist at IBM Ruschlikon, Switzerland during 1993-2002. Since 2002, he is working as a Professor at University of Strasbourg. During 2007-2014, he was the Leader of the Department of Surfaces and Interfaces at the IPCMS. Currently, he is mainly working on the Magnetism of Thin Films and has great expertise in Spin Polarized Electron Spectroscopies.

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