Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Unusual magnetic properties of superconducting Bi/Ni bilayers

HEXIN ZHOU, XIAOFENG JIN, Fudan University, JIN GROUP TEAM — Superconductivity and ferromagnetism are two incompatible phenomena. However, the interaction between them attracts numerous physicists' interests for both theoretical and experimental purposes. Recently, increasing experimental discoveries reveal unconventional effects in superconductor and ferromagnet hybrids, which stimulates a new field called superconducting spintronics. In present work, we report various intriguing magnetic properties of an unexpected superconducting bilayer consisting of non-superconducting Bi and ferromagnetic Ni. A large spontaneous magnetization is induced when the temperature is decreased below the superconductivity transition temperature, which indicates a complex interaction between superconductivity and ferromagnetism in this bilayer. The zero field cooling results show normal Meissner effect while the field cooling results show paramagnetic Meissner effect. Besides, magnetic hysteresis loops in low temperatures show flux pinning and flux jumping effects. Our findings pave the way for exploring unconventional superconductivity coupled to ferromagnetism and potential applications in superconducting spintronics.

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Date submitted: 14 Dec 2015 Electronic form version 1.4