

Proximity Effects in Superconductor/Ferromagnet Heterostructures

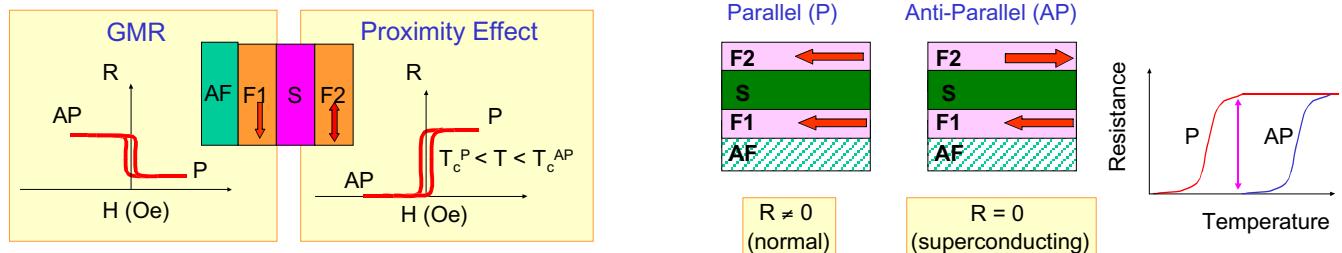
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MOTIVATION

- Interactions across an superconductor (S)/ferromagnet (F) interface
 \Rightarrow Cooper pairs and spin polarized electrons
- S/F hybrid devices : play an important role in magneto-electronics
- F/S/F or F/F/S sandwich \Rightarrow device applications
 (magnetoresistive memory elements or superconductive spin switches)

F/S/F trilayers

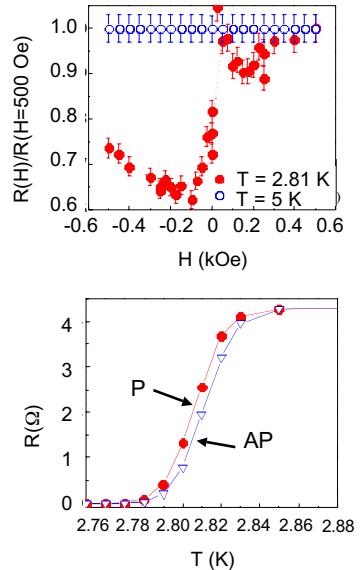
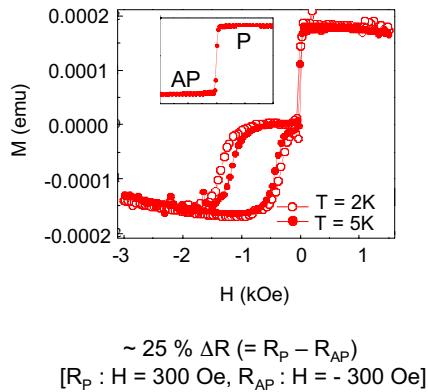
F/S/F system with a certain thickness of S layer ($d_S \leq \xi_S$) can be triggered from a normal to a superconducting state by applying a small magnetic field (P \rightarrow AP) in a certain temperature range ($T_c^P < T < T_c^{AP}$)



RESULTS

Py/CuNi(t_{CuNi})/Nb(t_{Nb})/CuNi(t_{CuNi})/Py/FeMn

FeMn	← AF pinning layer
Py	} Pinned F layer
CuNi	← Superconductor
Nb	
CuNi	← Free F layer
Py	
Si	← substrate



IMPACT and FUTURE DIRECTIONS

- First experimental evidence for the dependence of the superconducting T_c of a superconducting film sandwiched between two ferromagnetic layers on the magnetization orientation of the two F layers
- Nice example of the interplay between spin valve magnetism and superconductivity
- Future works : Interface analysis of CuNi/Nb interface (interface transparency (T_F))
 theoretical calculations for general cases are necessary

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 "Magnetization-orientation dependence of the superconducting transition temperature in the ferromagnet-superconductor-ferromagnet system: CuNi/Nb/CuNi" Phys. Rev. Lett. 89, 267001 (2002)



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