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Unusual occurrence of robust superconductivity and its coexistence with ferromagnetism in Ni/Ga bilayers JAGADEESH MOODERA, Dept. of Physics, Francis Bitter Magnet Lab, Plasma Science and Fusion Center, MIT, JIA SONG, Francis Bitter Magnet Lab, Plasma Science and Fusion Center, MIT, DON HEIMAN, Dept. of Physics, Northeastern Univ., VALERIA LAUTER, Oak Ridge National Lab, CHEN LI, Dept. of Mech. Eng., Univ. of California, Riverside, PENG WEI, Dept. of Physics, Univ. of California, Riverside — We demonstrate in Ni/Ga bilayer an unusual superconductivity (SC), with T_C as high as 7K, that co-exists with ferromagnetism (FM). Tunneling spectroscopy studies at LHe temperatures showed the presence of three SC energy gaps in the bilayers, attributable to surface, interface and bulk states. The bottom Ni layers, ranging from 0.8 to 6nm thick, confirmed to be ferromagnetic by the hysteretic magnetization results. Moreover, spin polarized tunneling studies revealed that the tunneling electrons coming from the Ni surface were spin polarized and simultaneously displayed SC gap, supporting the co-existence of SC and FM. A hysteretic structural phase transition observed near room temperature indicates a possible Ni-Ga compound formation. Interfacial characterization with synchrotron x-ray and polarized neutron reflectivity measurements are being carried out to reveal the interfacial FM, chemical and structural properties. The interplay of SC and FM with the presence of spin polarized carriers in such bilayer system could be a strong case for triplet pairing and thus represents a significant step towards superconducting spintronics. Supported by NSF, ONR and Scientific User Facilities Division at ORNL by BES of DOE.

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