Search for Superconductivity in Cu-Chlorides and Ferromagnetism in Partially Oxidized CuCl

THOMAS SAERBECK, JUAN PEREIRO, JAMES WAMPLER, JACOB STANLEY, JAMES WINGERT, OLEG G. SHPYRKO, IVAN K. SCHULLER, Department of Physics and Center for Advanced Nanoscience, University of California San Diego — The phase diagram of copperhalides shows a rich diversity not only in crystalline structure, but also in magnetic and electronic properties. In particular, the chemically unstable CuCl has been proposed several times as a candidate for high-temperature superconductivity. We present a search for superconductivity in systems of CuCl/Si and CuCl$_2$/Si, which leads to the observation of ferromagnetism with a $T_c$ of 18 K in bulk CuCl samples [1]. The hitherto unreported magnetism is found to emerge in pure CuCl upon prolonged exposure to humid air. Magnetic field modulated microwave spectroscopy in addition to SQUID magnetometry and x-ray diffraction are used to identify phase transitions and compare them to the antiferromagnetic transitions in other Copper-chloride structures.


This work is supported by AFOSR-MURI Grant no. F49550-09-1-0577.