Session 25bE

Superconductivity in Boron and related materials at megabar pressures. 25bE1

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We performed electrical and optical measurements at pressures up to 260 GPa and down to millikelvin temperatures to study metallization and searching for superconductivity in a number of elemental and simple substances: S, Se, Xe, CsI and others. In the report, we will focus on superconductivity in boron and also on electrical properties of nitrogen and hydrogen at megabar pressures.

Superconductivity in the Pyrochlore Oxide $Cd_2Re_2O_7$ 25bE2

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Pyrochlore oxides belong to one of the largest structural groups for transition metal oxides. Although many metallic pyrochlore oxides have been known, there were no compounds to exhibit superconductivity so far. Recently superconductivity at T_c = 1.0 K was found in $Cd_2Re_2O_7$. The following experimental results have revealed a unique correlation between the crystal and electronic structures for the itinerant electron system in the pyrochlore lattice.

25bE3 Superconductivity in Pyrochlore-Type Frustrated Spin System, $Cd_2Re_2O_7$

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Recently, the geometrical frustration in strongly correlated electron system has been attracted considerable interest. The pyrochlore oxides which have a general formula, $A_2B_2O_6O$' contain tetrahedral networks of A and B cations, leading to a geometrical frustration. Some of them exhibit a wide variety of physical properties from insulating through semiconducting and bad metallic toward good metallic. Among them, $Cd_2Re_2O_7$ has newly been reported to exhibit the type II superconductivity at 1.1 K [1, 2]. Here, we report our discovery [1] of the occurrence of superconductivity in the pyrochlore-type frustrated spin system, $Cd_2Re_2O_7$. Furthermore, its physical properties will be reviewed.

[1] H. Sakai, K. Yoshimura et al., J. Phys.: Condens. Matter 13(2001) L785-L790.
[2] M. Hanawa, Z. Hiroi et al., Phys.Rev. Lett. 87 (2001) 187001.

25bE4 Superconductivity in Ropes of Single-Walled Carbon Nanotubes

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We report measurements on ropes of single-walled carbon nanotubes (SWNT) in low-resistance contact to nonsuperconducting metallic pads, at low voltage and at temperatures down to 13 mK. Large resistance drops and strong non-linearities in the IV characteristics are observed below 0.4K. These features, which disappear in magnetic field in the Tesla range, strongly suggest the existence of superconductivity in ropes of SWNT.

25bE5 NMR studies of the electron-doped hafnium nitride superconductor

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NMR measurements were carried out on recently discovered layered superconductor $Li_{0.48}(THF)_yHfNCl$. ^{7}Li-NMR results suggests that the Fermi level density of states at intermidiated Li site are considerably small and the superconductivity is derived from the HfNCl layer.