Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

T_c vs Isotopic Mass and vs Residual Resistivity Investigation in MgB_2 MARINA PUTTI, University of Genova, MATTEO TROPEANO, PAOLO BROTTO, CARLO FERDEGHINI, ENRICO GALLEANI , PIETRO MANFRINETTI, ANDREA PALENZONA — Almost five years after the discovery of superconductivity in MgB_2 the isotope effect on T_c is not yet understood (M. Calandra et al, Physica C456, 38 (2007) and references therein). The isotope effect is mainly due to the B atoms reflecting the important role of B vibrations in determining T_c. Detailed two bands calculation leads to α(B) of the order of 0.4–0.45, in disagreement with experiments which evaluated α(B) = 0.30. Anharmonicity was proposed as a possible explanation for the reduced B isotope coefficient, but recently it was emphasized that such an explanation needs to be reconsidered. On the other hand, recent investigations on the effect of disorder on T_c pointed out that samples with residual resistivity (ρ_0) of few $\mu\Omega$cm present T_c variations comparable with the intrinsic variations due to isotopic effect. This calls for new investigations of isotopic effect in samples with controlled amount of disorder. Ultra clean $Mg^{10}B_2$ and $Mg^{11}B_2$ samples (ρ_0 $\sim$0.5 $\mu\Omega$cm) were damaged respectively with annealing and neutron irradiation and T_c and resistivity were measured. T_c vs ρ_0 plot shows in both cases a linear relationship allowing us to extrapolate T_c (ρ=0)g for both the sample series. α(B) evaluated by these intrinsic T_c values confirms results of previous report and the crucial role of disorder in determining T_c has been proved.

Marina Putti
University of Genova

Date submitted: 27 Nov 2007 Electronic form version 1.4