Comparative AC Susceptibility Study of $Ag_7O_8NO_3$ and Sr_2RuO_4

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$Ag_7O_8NO_3$ is a type-II superconductor with a T_c of 1.04 K and anisotropic upper critical field H_{c2} of about 800 Oe. The residual-resistivity ratio (RRR) is reported to be 200, reflecting that this material is in the clean limit. The Ginzburg-Landau (GL) parameter is very high, ca. 100 [1]. Sr_2RuO_4 is also a type-II superconductor with a spin-triplet order parameter and a T_c of 1.5K. For H parallel to the c axis H_{c2} is about 750 Oe. Moreover, the GL parameter amounts to 46 and the RRR is of the order of 1000 [2]. Obviously both compounds exhibit similar physical properties, i.e. the values of T_c, H_{c2}, and RRR are on the same order of magnitude, although the symmetry of the order parameter is essentially different.

In this talk we will present a detailed investigation of the $H-T$ phase diagrams of $Ag_7O_8NO_3$ and Sr_2RuO_4 obtained by measuring the complex AC susceptibility $\chi_{AC} = \chi' + i\chi''$. In spite of the interestingly similar physical properties of the two systems, it turns out that the qualitative behavior of χ_{AC} differs significantly (Fig.1). For $Ag_7O_8NO_3$ we observe a pronounced two-peak structure in the imaginary part χ'' at low DC fields which merge at higher fields. The fact that the second peak already exists at low fields rules out an explanation based on simple vortex effects. In contrast to this for Sr_2RuO_4 in zero field a sharp single peak is observed and a second peak develops at higher DC fields, indicating a collective pinning of the softened vortex lattice. Moreover, we observe a hysteresis of the second peak in higher DC fields between field-cooling and subsequent warming runs.

Whereas the two-peak structure for Sr_2RuO_4 can be explained by vortex-lattice effects, for $Ag_7O_8NO_3$ the origin of the second peak remains unclear.

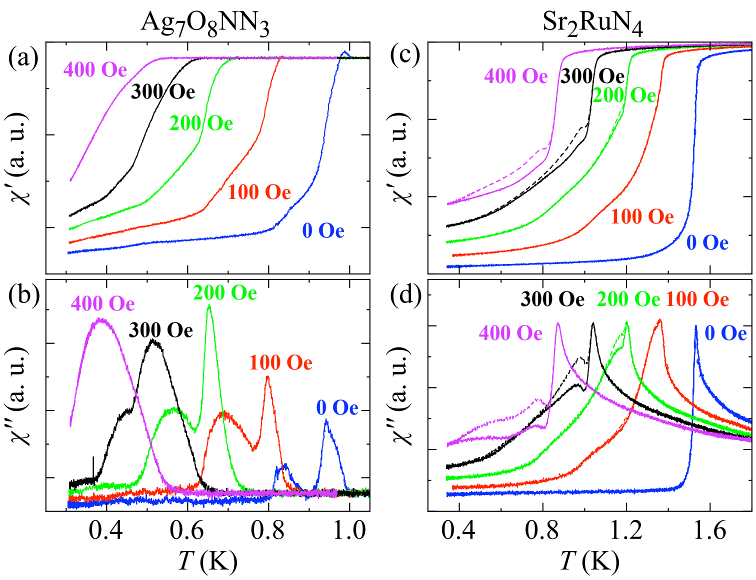

Fig. 3: AC susceptibility for $Ag_7O_8NO_3$ (left) and Sr_2RuO_4 (right). The upper two panels (a) and (c) show $\chi'(T)$ (real part; diamagnetic shielding), the lower (b) and (d) $\chi''(T)$ (imaginary part; energy dissipation) indifferent H_{DC}.

[1] M. B. Robin et al., Phys. Rev. Lett. **17**, 917 (1966).
[2] A. P. Mackenzie and Y. Maeno, Rev. Mod. Phys. **75**, 657 (2003).