Reply to "Comment on 'Uniaxial anisotropic flux trapping in Y-Ba-Cu-O and Bi-Sr-Ca-Cu-O single crystals' "

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By comparing data of the angular dependence of the remanent magnetization for a ceramic sample and for a single crystal of $YBa_2Cu_3O_7$ with similar demagnetization factors, we conclude that intrinsic anisotropy contributes significantly to anisotropic flux trapping in the crystal.

In Ref. 1 we demonstrated the existence of uniaxial anisotropy in crystals of high-temperature superconductors (HTSC) by measuring the angular dependence of the remanent magnetization. In these meausrements the sample is cooled in a field **H**; the "cooling angle" ϕ is the angle between **H** and a principal crystallize axis. (Here we refer only to the crystalline c axis.) At temperature $T < T_c$ the field is turned off and the remanent magnetization $M_{\rm rem}$ is recorded while the sample is rotated relative to **H**. The axis of rotation is parallel to c and θ is the angle between **H** and c. The angular dependence data ($M_{\rm rem}$ vs θ), for various ϕ, are exhibited in Fig. 1 of Ref. 1. The dominant features of this figure are the pronounced minima at fixed angle $\theta = 180°$, *independent* of ϕ (except for ϕ very close 90°). We thus concluded that c is an anisotropic axis. In similar measurements[2] on ceramic HTSC, we had found these minima to be always located 180° relative to the cooling angle, thus **H** defines an anisotropic direction.

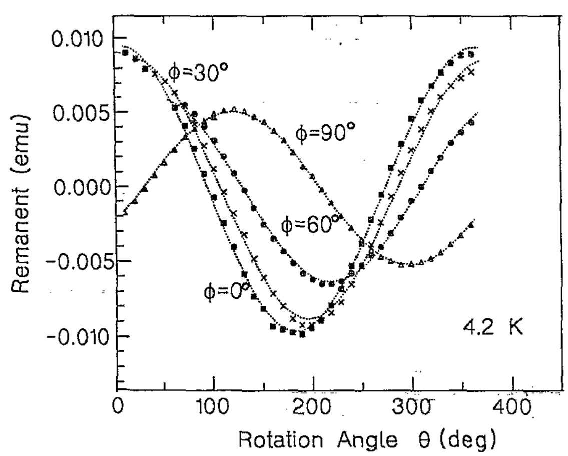

FIG. 1. Angular dependence of the remanent magnetization for the indicated cooling angles ϕ, at 4.2 K and a field of 500 Oe, for a flat ceramic Y-Ba-Cu-O sample. $\phi = 0°$ for **H** parallel to the thin dimension.

Kolešnik *et al.*[3] argue that strong demagnetization corrections of the applied field, due to the shape of the sample, induce the observed angular dependence in crystals. Their Fig. 2 demonstrates that, indeed, geometry plays an important role in the measured anisotropy. In order to estimate the relative importance of the geometry, we repeat the angular dependence experiment of Ref. 1 for a ceramic Y-Ba-Cu-O sample ($2.1 \times 1.7 \times 0.15$ mm^3) with demagnetization factors very similar to those of our Y-Ba-Cu-O crystal of Ref. 1. Here, the "cooling angle" $\phi = 0°$ for **H** parallel to the thin (0.15 mm) dimension. The results, which are shown in Fig. 1, demonstrate clearly the effect of geometry. The minima which are expected[2] at $\theta = \phi + 180°$, are found now at smaller θ values, as predicted by Kolésnik *et al.* However, if geometry plays the main role in determining $M_{\rm rem}(\theta)$ of Y-Ba-Cu-O crystals,[1] one would expect a similar shift in the location of the minima in these crystals. The fact that the peaks are ϕ independent (Fig. 1 of Ref. 1) points to a strong intrinsic anisotropy in Y-Ba-Cu-O crystals.

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[1] I. Felner, U. Yaron, Y. Yeshurun, G. V. Chandrashekhar, and F. Holtzberg, Phys. Rev. B **40**, 5239 (1989).
[2] Y. Wolfus, Y. Yeshurun, and I. Felner, Phys. Rev. B **37**, 3667 (1988).
[3] S. Kolešnik, T. Skośkiewicz and J. Igalson, preceding Comment, Phys. Rev. B **43**, 13 679 (1991).

