Groh and Dietrich Reply: In Ref. [1], as stated there explicitly, we studied ferroelectricity in dipolar fluids under the constraint of a homogeneous polarization. As announced in Ref. [1], work on domain formation is in progress using the same theory. The analysis of the homogeneous case is a necessary prerequisite for this demanding task. Widom and Zhang [2] surmise that as a result of such a study the phase diagrams including domain formation will turn out to be independent of the sample shape and correspond to that of an infinitely long needle with a single domain. The latter is contained in our previous analysis as the special case $k = \infty$, where k denotes the aspect ratio of an ellipsoidal sample. It leads to the phase diagrams shown in Fig. 1. As a function of the reduced dipole moment m^*, they exhibit the same topological structure as those shown in Ref. [1] as function of k with m^* fixed. [There the pendant of Fig. 1(a), which contains a critical end point T_{cep}, was not shown for reasons of space.] In the meantime a similar series of phase diagrams has been found based on an ansatz for the free energy [3].

In contrast to this approach our analysis keeps track of the dependence on the parameters of the underlying interaction potential and renders, in addition, the orientational distribution $\alpha(\omega)$ which exhibits a nontrivial behavior even for $k = \infty$. Even if the homogeneous states turn out to be metastable they may exhibit long lifetimes so that our results for $k < \infty$ may be accessible through, e.g., computer simulations. The shape dependence will *certainly* prevail if an external field $E \neq 0$ is applied [4,5], which tends to suppress the domain formation. For $E \neq 0$, the loci of first order transitions will be shifted and while for $k = \infty$ the line of critical points $\rho_{fc}(T)$ will be washed out, for finite aspect ratios there may still exist a line of second order transitions between homogeneously and inhomogeneously polarized phases [5,6].

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[1] B. Groh and S. Dietrich, Phys. Rev. Lett. **72**, 2422 (1994); Phys. Rev. E **50**, 3814 (1994).
[2] H. Zhang and M. Widom, preceding Comment, Phys. Rev. Lett **74**, 2616 (1995).
[3] H. Zhang and M. Widom, Phys. Rev. E **49**, 3591 (1994).
[4] P.M. Levy and D.P. Landau, J. Appl. Phys. **39**, 1128 (1968); P.M. Levy, Phys. Rev. **170**, 595 (1968).
[5] B. Groh and S. Dietrich (unpublished).
[6] P.J. Wojtowicz and M. Rayl, Phys. Rev. Lett. **20**, 1489 (1968).

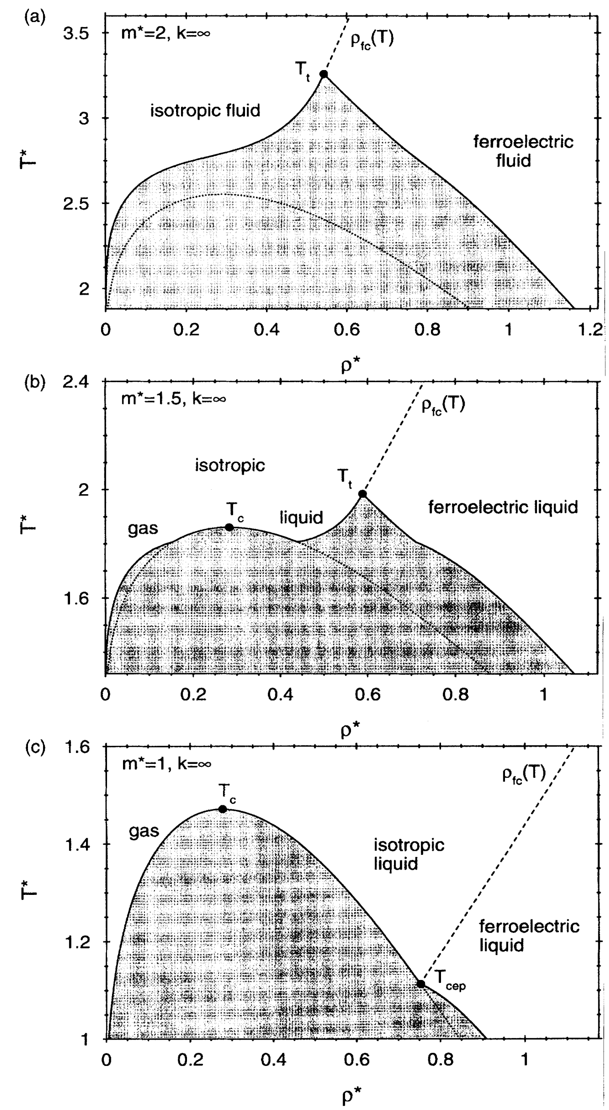

FIG. 1. Phase diagrams for (a) $m^* = 2$, (b) $m^* = 1.5$, and (c) $m^* = 1$ for a needle-shaped sample. For the precise definition of the various symbols, see Ref. [1].

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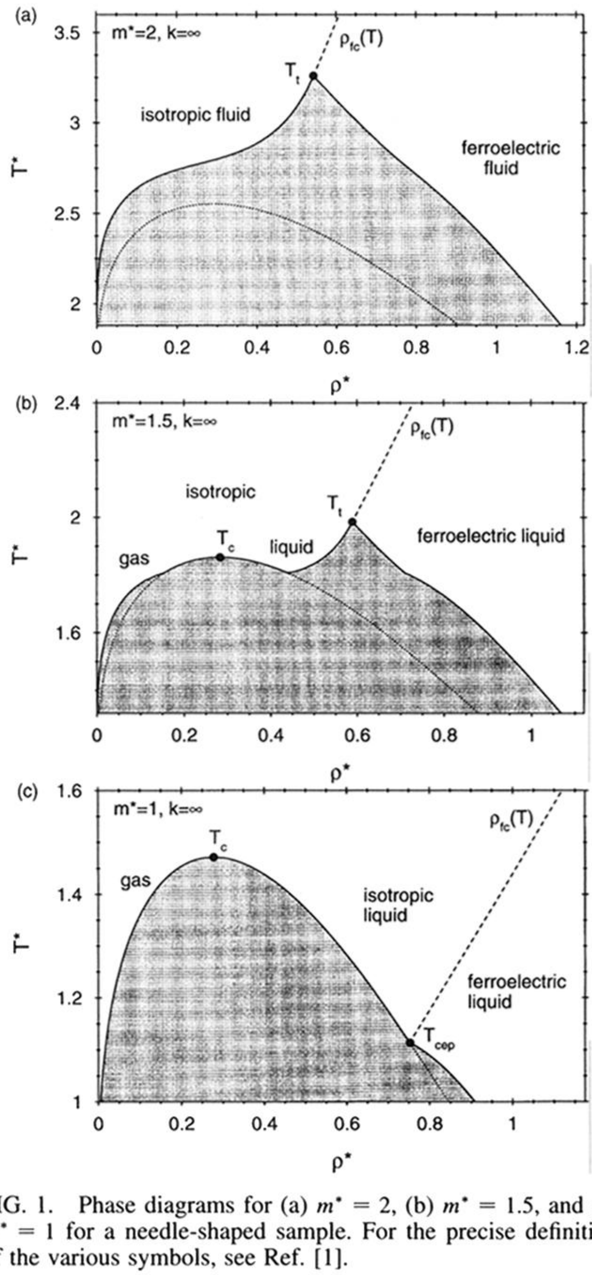

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