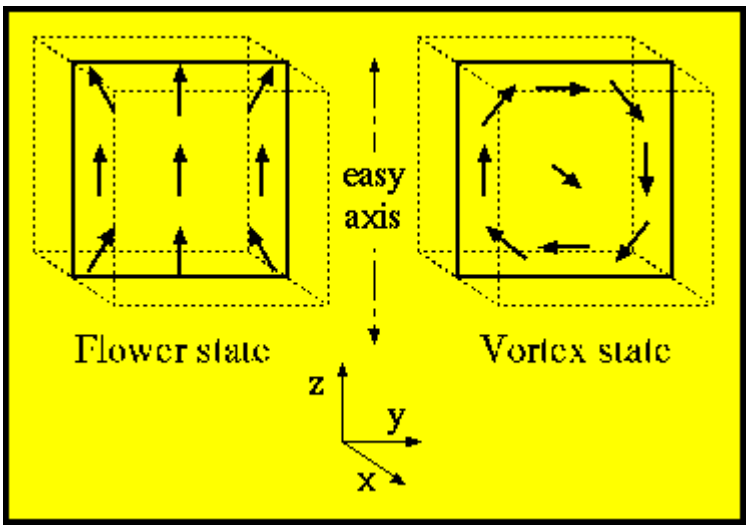
µMAG Standard Problem #3



Problem proposed by Alex Hubert, University of Erlangen-Nuremberg.

Please send comments to rmcmichael@nist.gov and join the µMAG discussion e-mail list for ongoing discussion.

A set of solutions have been submitted.

Specifications

This problem is to calculate the single domain limit of a cubic magnetic particle. This is the size L of equal energy for the so-called flower state (which one may also call a splayed state or a modified single-domain state) on the one hand, and the vortex or curling state on the other hand.

Geometry:

A cube with edge length, L, expressed in units of the intrinsic length scale, $l_{ex} = (A/K_m)^{1/2}$, where K_m is a magnetostatic energy density, $K_m = {}^1/_2\mu_0 M_s{}^2$ (SI) or $2piM_s{}^2$ (cgs emu).

Material parameters:

Uniaxial anisotropy K_u with $K_u = 0.1\ K_m$, and with the easy axis directed parallel to a principal axis of the cube.

Desired output for comparison:

- The indicated "single domain limit," L where the energy of the flower state is equal to the energy of the vortex state.
- The partial energies (exchange, stray field, anisotropy) all in units of K_m.
- The average magnetization along the three axes.

All these values should be given for both configurations (flower and vortex) at the single domain size. The results should be shown to be independent of the

discretization size.

Please see the µMAG standard problem strategy page for information on publicizing your results.

Comments:

The transition is expected to be found in the neighborhood of $L = 8\ l_{ex}$.

Site Directory

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