On the colapse of demagnatizing and Lorentz field formalism for thin films and nanoparticles

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It will be shown that the demagnetizing field concept, divorced from the crystal structure, collapse in the nanoscale. The Split of the dipolar tensor into a demagnetizing contribution and a crystal dependent Lorentz contribution is no longer valid in nanoscale structures. The dipolar field tensor is still a valid operator. The mathematical demonstration of this collapse will be exemplified with thin films calculation and small particles calculation. In the former case a stochastic system with magnetic and nonmagnetic atoms will be also shown as an example of dipolar favored perpendicular easy direction system with more realistic interlayer distance. In the small particle calculation the validity of the demagnetizing approach will be explored in its dependence with particle size and shape.