

Structural analysis of magnetic skyrmions and skyrmion lattice by electron holography

K. Shibata¹, A. Kovács², N. S. Kiselev³, N. Kanazawa⁴, R. E. Dunin-Borkowski², and Y. Tokura^{1, 4}

¹Center for Emergent Matter Science, RIKEN, Japan,

²Ernst Ruska-Centre for Microscopy and Spectroscopy, Forschungszentrum Jülich GmbH, Germany,

³Institute for Advanced Simulation and Peter Grünberg Institute, Forschungszentrum Jülich GmbH, Germany,

⁴Dept. of Applied Physics, the Univ. of Tokyo, Japan

In some chiral-lattice helimagnets, nano-scale magnetic vortices, skyrmions, are stabilized and arrange as trigonal lattice state, skyrmion lattice. Skyrmions and skyrmion lattice have been attracting attention due to their rich physical properties. Meanwhile, temperature and magnetic field dependence of detailed skyrmion lattice structure have not been investigated.

Here, we present structural analysis on skyrmions in helimagnet B20-type FeGe using electron holography. By analyses on the obtained phase maps, we have revealed temperature and magnetic field dependence of skyrmion structure. Increasing temperature weakens the local magnetic moment towards the transition temperature, but shape of skyrmion structure remains almost unchanged. Increasing magnetic field shrinks the cores of skyrmions. We have also observed slight hexagonal deformation of skyrmions in the peripheral region of skyrmions.

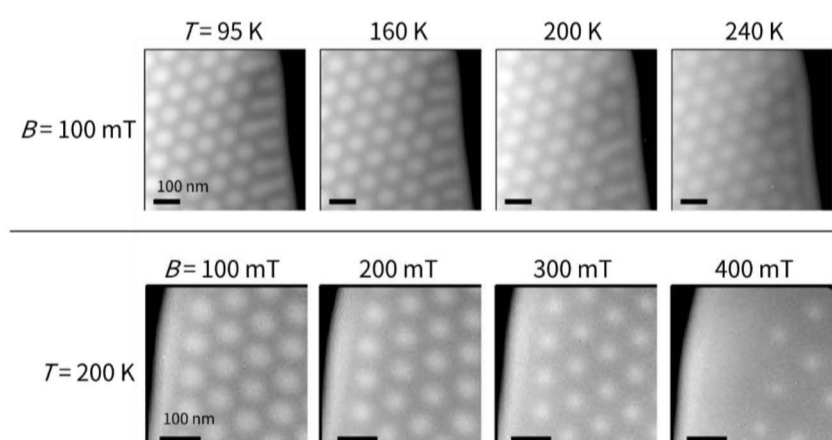


Fig. Temperature T and magnetic field B dependence of the reconstructed phase shift distribution of magnetic skyrmions in B20-type FeGe.