Flux measurements on ferromagnetic microprobes by electron holography

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Bulk ferromagnetic microprobes, as commonly used in magnetic force microscopy, have been analyzed by electron holography. Using the double exposure technique, detailed holograms have been obtained from nickel probes. The resulting two-dimensional interferograms can be well reproduced by numerical calculations which are based on the assumption that the probes stray field is produced by a macrodipole of several micrometers in length. By treating the dipole charge as a variational free parameter to be fitted against the experimental data, it is possible to determine the stray field produced by the probes, their effective leakage flux, and the surface area of a sample which may seriously be affected by the probes stray field. The results are considered especially important for those applications of magnetic force microscopy where the sample is likely to be magnetically perturbed by the stray field which is produced by the imaging probe itself.