

Nanostructured surfaces

Periodic modulations of a magnetostatic field in a ferromagnetic cylinder and their influence on etching figure formation in acid solutions

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Ferromagnetic materials are known to possess domain structure due to competition of magnetic interactions of the certain types. The parameters of certain types of domain structure and their separate elements have been widely studied both by experimental and theoretical methods, for example [1,2]. Except the practical application of such materials in magnetic devices, investigation of magnetic configurations is interesting itself in the theory of the non-linear equations and theirs soliton-like solutions.

The present work shows that the inhomogeneous long-wave magnetic configuration of harmonic type can be created and observed in cylindrical samples with "easy magnetic plane" anisotropy which is perpendicular to the axis of a cylinder. A linear theory was built to simplify the system of Landau–Lifshitz and Maxwell's equations to one general equation for a magnetostatic potential.

The theory proposed gives qualitative explanation of the experiment when using Bitter's powder-like figures method quasi-periodical distributions of the magnetostatic fields can be observed in samples. Its results are also in agreement with predictions made in [3].

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2. A.P. Malozemoff, J.C. Slonczewski Magnetic domain walls in bubble materials, New York, 1979.

3. O.Yu. Gorobets, Yu.I. Gorobets, V.P. Rospotnyuk Electromotive Force at Etching of Homogeneously Magnetized Ball in the Electrolyte // Physics of Metals and Advanced Technologies.-2012.- **34**.-P.895-906.