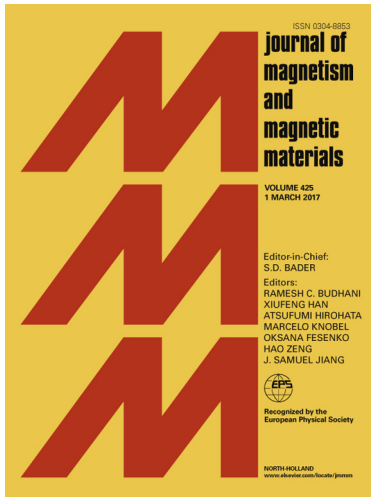


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A.V. Sandulyak, A.A. Sandulyak, M.N. Polismakova, D.A. Sandulyak, V.A. Ershova

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# The Approach to the Creation and Identification of the Positioning Zone of the Sample in the Faraday Magnetometer

**A. V. Sandulyak, A. A. Sandulyak[1], M. N. Polismakova, D. A. Sandulyak, V. A. Ershova**

[1] Moscow Technological University, Moscow, Stromynka 20, anna.sandulyak@mail.ru +74957235244.

The question of creation and identification of the Faraday magnetometer working zone, in which the sample (of small dimensions) to be located, when determining its magnetic susceptibility, is analyzed. This question is still insufficiently covered from the standpoint of mathematical and physical models. There is provided a variant of the Faraday magnetometer (of electromagnetic type) renovation – with pole-hemispherical tips that are providing an unconditional presence and possibility of detecting a working zone of practical stability: both for the gradient and the magnetic force factor.

It is noted that the approach to the creation and identification of the working zone must necessarily be based on a specially obtained coordinate characteristic of induction or field density. At the same time, it is acceptable to recognize the result when such a characteristic (usually nonlinear and not yielding to a desirable, even partial, linear approximation) has an inflection. In this case, a linear approximation of its section in the vicinity of inflection is possible, and hence the obtaining of stable (almost constant) gradient values here is possible as well. This is clearly demonstrated by the corresponding extremum of the gradient coordinate characteristic: in its vicinity, the gradient values are practically stable, which corresponds to one of the recognized options of the sample positioning condition.

It is shown that in the case of obtaining an extreme gradient coordinate characteristic, there is an extreme form of the magnetic force factor coordinate characteristic – the product of induction or density on the gradient: in the vicinity of the extremum the values of this factor are practically stable, which corresponds to one more of the recognized options of the sample positioning condition.

It is determined that for each of the distances between the pole-hemispherical tips the coordinates of the extrema remain practically unchanged - regardless of the current load, and the extrema of the force factor are 30-40% closer to the axis line of the poles than the extrema of the gradient. The effect of this distance on the coordinates of the gradient and force factor (logarithmical increasing dependence) extrema is revealed, as well as on the values of these extrema (power decreasing dependence).

**Keywords:** Faraday magnetometer, pole-hemispherical tips, sinuous induction characteristics, extreme gradient and force factor characteristics.

## 1. Introduction

For a long time one of the methods for controlling the magnetic susceptibility of various samples has been the ponderomotive Faraday method. To implement it – using the Faraday magnetometer (Faraday balance) – it is enough to use only small (often objectively small) samples [1-5]: not only solid, but also dispersed ones [2-4, 6-10] (powdery, in particular). This circumstance makes, for example, the determination of the iron admixtures susceptibility to natural and technogenic media comparatively accessible (for the purposes of their magnetophoresis and magnetic control [11-20]) when it is necessary to deal with objectively small volumes of the dispersed phase of iron admixtures of these media.