
Magnetic Fluid Bridge in a Non-Uniform Magnetic Field

D.A. Pelevina, V.A. Naletova, V.A. Turkov

Lomonosov Moscow State University

pelevina.daria@gmail.com

The ability to use a magnetic fluid (MF) surface deformation in the field of a line conductor to create bridge between the planes [1] and coaxial cylinders [2] is investigated.

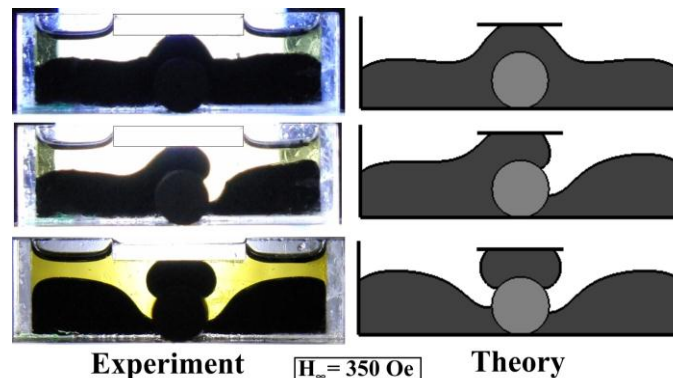


Figure 1. Various static shapes of MF bridge in experiments and theory.

In this work the surface shape of a MF containing a cylindrical ferromagnetic body in the applied uniform vertical magnetic field H_{∞} is studied experimentally and theoretically. The MF volume is located between two horizontal planes. There is a small gap between the cylindrical surface and the upper plane. At the magnetic field, the MF volume can close the gap. Various stable shapes of the MF consisting of one, two or three volumes are obtained at the fixed magnetic field in the experiments and theory, see Fig.1. In the experiments, hysteresis and abrupt changes of the bridge shape in an alternating magnetic field is observed. Dependencies of minimal volume of MF required to various shapes of the bridge on the applied magnetic field are obtained. The theoretical results are in a good agreement with experiments. The results of this study may be useful in the MF valve design.

Acknowledgments

This research is supported by Russian Foundation for Basic Research (projects 16-51-00004, 16-31-60091) and grant of President RF (4541.2016.1).

References

- [1] T.I. Volkova, V.A. Naletova, *Fluid Dynamics*, **49**(1) (2014) 3;
- [2] A.S. Vinogradova, V.A. Naletova, V.A. Turkov, *Solid State Phen.*, **233-234** (2015) 335.

Preferred Session: Theory and Computer Simulations.