Limited liability company

«Engineering solutions»

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Magnetic Field Locking And Levitation Force

We present to your attention a kit for demonstrating the levitation force and magnetic field locking by a domain YBCO superconductor.

The kit includes:

- domain superconductor disk 20x5mm - 1pcs.
- plastic container - 1pcs.
- neodymium magnet 15x15x15mm - 1pcs.
- spacer for distance fixation - 1pcs.
- non-magnetic tweezer - 1pcs.
- instructions with explanations - 1pcs.

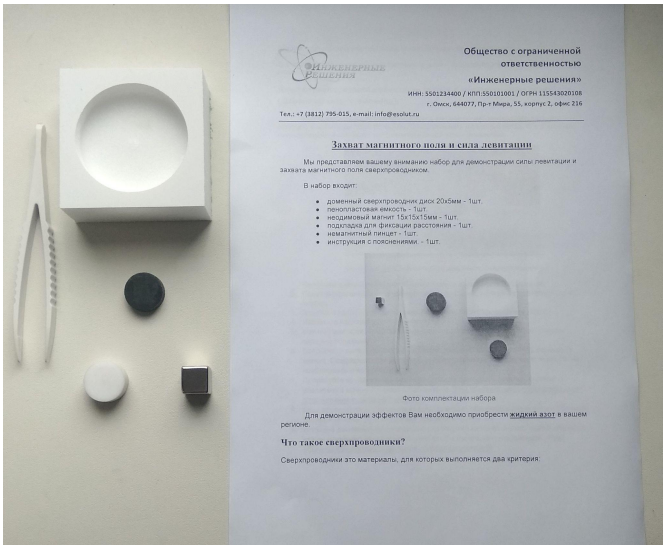

Photo of the kit contents

To demonstrate the effects, you need to purchase **liquid nitrogen** in your region.

What are superconductors?

Superconductors are materials that satisfy two criteria:

1) the electrical resistance in the superconductor is zero;

2) the magnetic field inside the superconductor is zero - the superconductor is an ideal diamagnet.

Demonstration of magnetic field locking and power levitation force (Domain superconductor).

The capture of a magnetic field occurs in a domain superconductor when it is cooled in a magnetic field. If an attempt is made to change the magnetic field, a current will be generated in the domain superconductor that prevents this change.

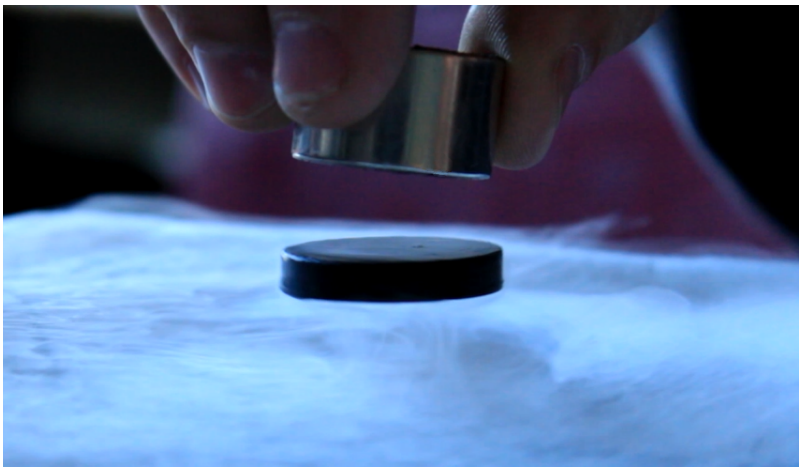

Photo of a domain superconductor hanging under a magnet

1. Put the domain superconductor in the center of the container for cooling.
2. Place the spacer on the domain superconductor, and then place the neodymium magnet on it.
3. Pour liquid nitrogen and wait for the entire superconductor to cool.
4. Remove the spacer from under the magnet.
5. The magnet levitates above the domain superconductor at a distance equal to the thickness of the spacer.
6. Try pulling the domain superconductor out of the liquid nitrogen by pulling on the magnet. The superconductor is held at a fixed distance from the magnet without approaching or moving away.
7. Try pressing the magnet to the surface of the domain superconductor and feel the power of the repulsive force. !!!The repulsive force on a simple YBCO superconductor is very small!!!
8. If you use a thin spacer, you can freeze a significantly larger magnetic field. To do this, you need to perform steps 1-4.

9. By pulling the domain superconductor out of the liquid nitrogen with the magnet, you can see that it is stably captured by the magnet no matter how you turn it. !!!This effect is absent on a simple superconductor!!!
10. The domain superconductor taken out of the liquid nitrogen heats up after a while, so we recommend cooling it approximately once every 10 seconds by immersing it in liquid nitrogen.

Additional information.

High-temperature superconducting ceramic YBCO is a material consisting of small crystallites sintered together into a single product.

In simple superconducting ceramics ($YBa_2Cu_3O_{7-x}$), all crystallites are superconducting, have the same composition, and are also randomly distributed throughout the volume, due to which only the Meissner effect is observed in it and there is no **quantum locking** effect.

Domain superconducting ceramics ($Y_{1.8}Ba_{2.4}Cu_{3.4}O_{7-x}$) consists of crystallites of different composition, both superconducting and not, in addition, in such ceramics, all crystallites are ordered in a certain way in one direction (forming a domain), which creates an additional **magnetic field trapping effect** ("**quantum locking**") and significantly enhances the **levitation force**.