



Trapped Field Characteristic of A HTS Magnet with Two holes Using Four Magnetization Methods

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Introduction

Strong magnetic field plays an extremely important role in the development of science and technology, which breeds many major scientific discoveries and new technologies. Recently, research of HTS magnets have achieved some important progress in many fields, such as medicine (magnetic resonance imaging), pharmacy (nuclear magnetic resonance) as well as other scientific and industrial fields.

In this paper, a novel HTS magnet stacked of 60 REBCO double-hole rectangular plates is proposed. Four magnetization methods are carried out, that are field cooling (FC), zero field cooling (ZFC), FC with inner magnetization and ZFC with inner magnetization.

Results and Discussion

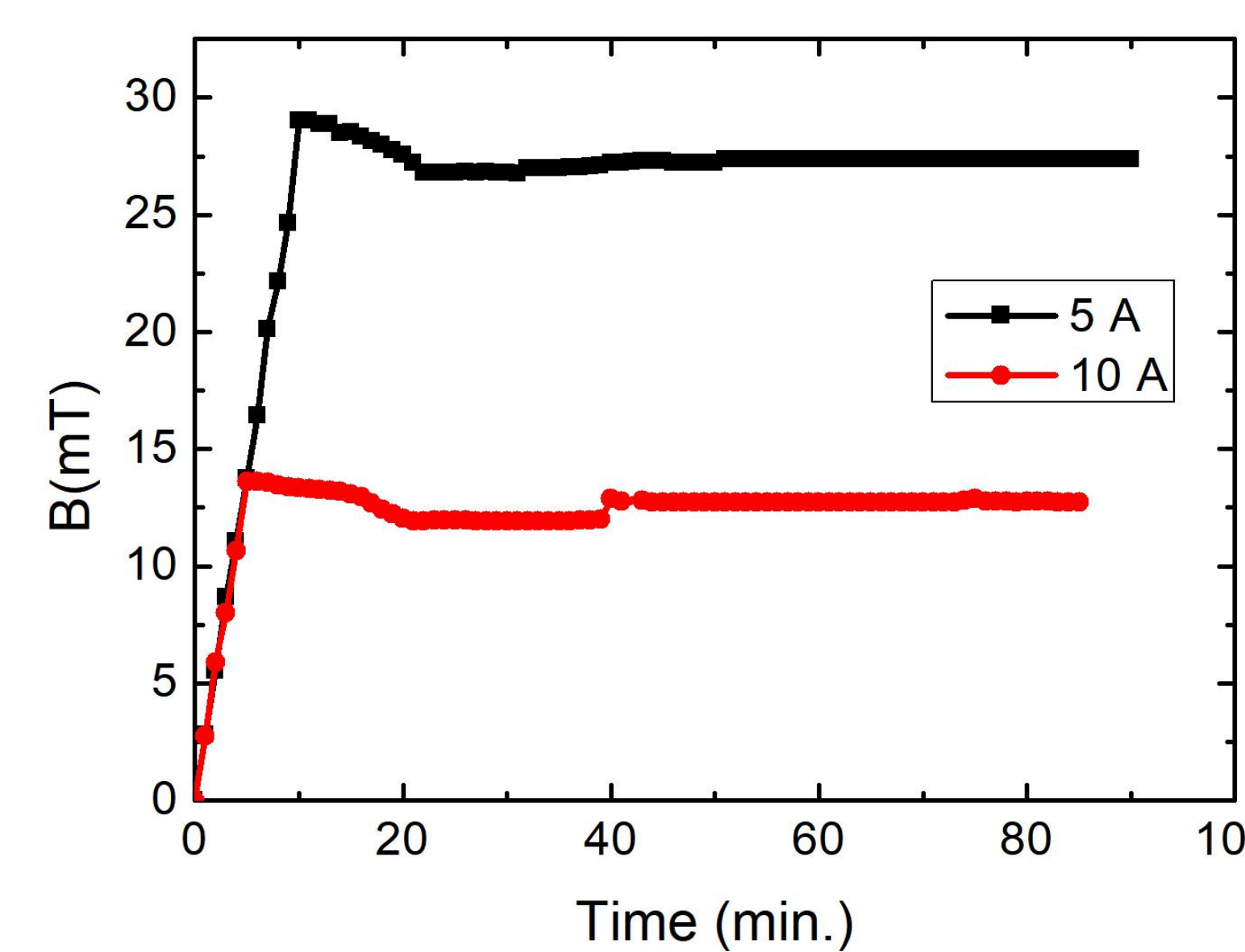


Fig. 4. Magnetic field at right hole center of double-hole HTS magnet during FC magnetization

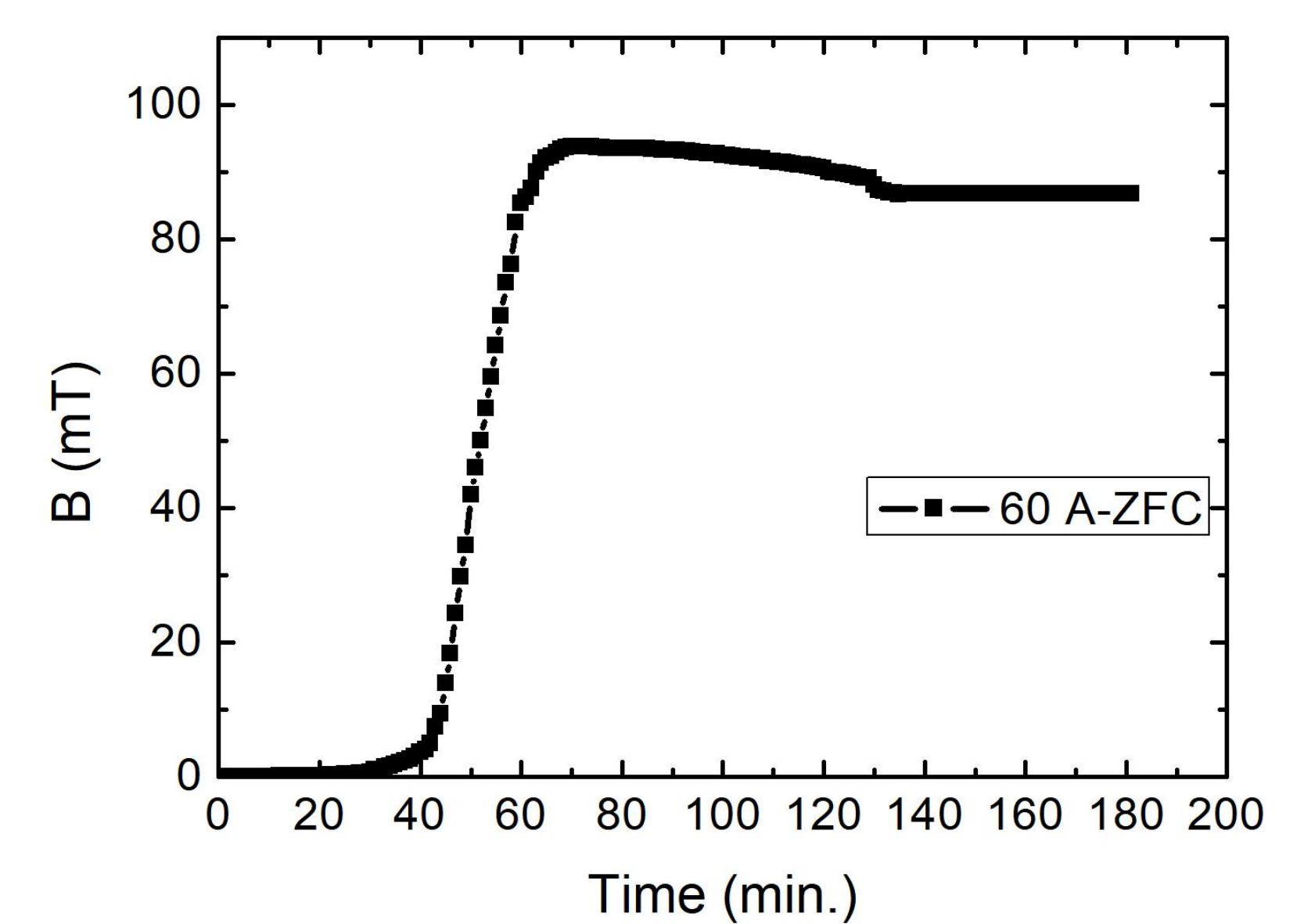


Fig. 5. Magnetic field at right hole center of double-hole HTS magnet during ZFC magnetization.

Structure of the Double-hole Rectangular HTS magnet

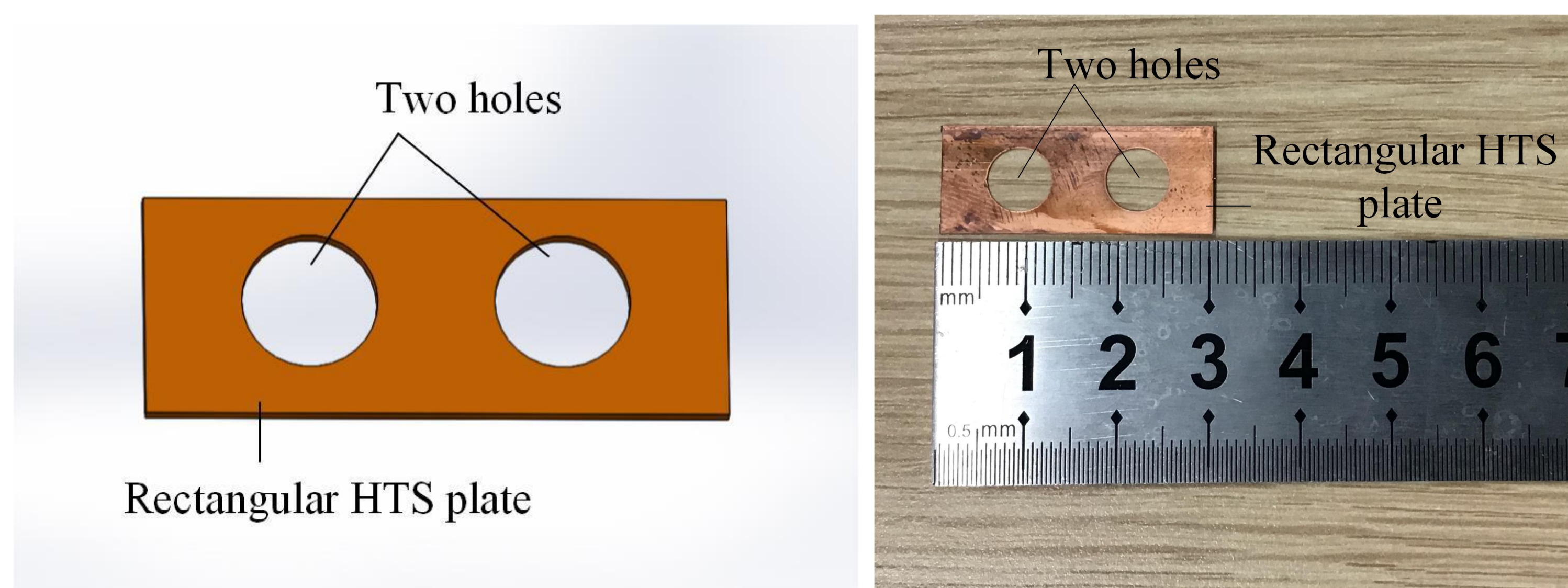


Fig. 1. (a) Photo of a double-hole rectangular HTS plate. (b) The photo of a rectangular HTS magnet.

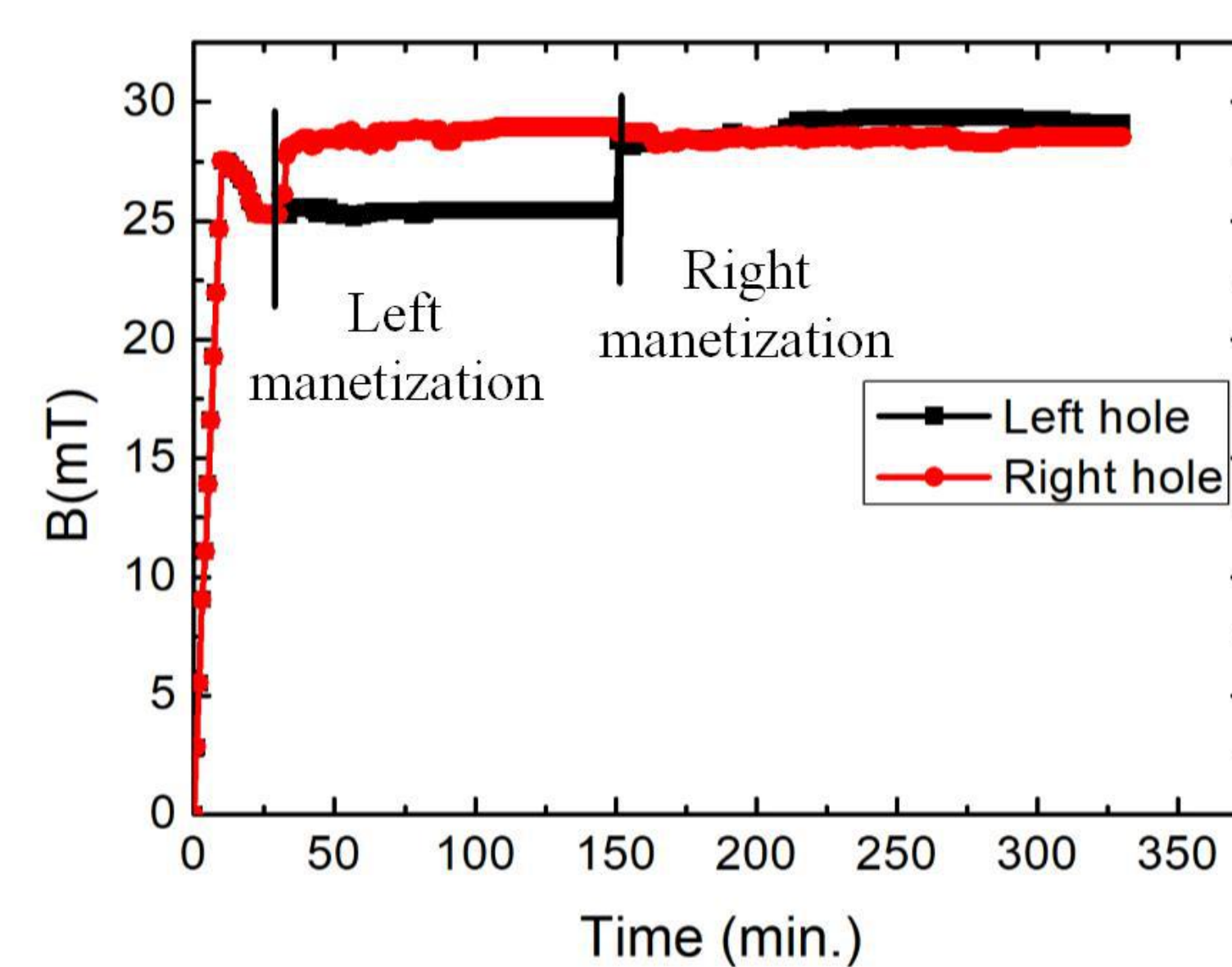


Fig. 6. Central trapped field of two holes in FC with inner magnetization.

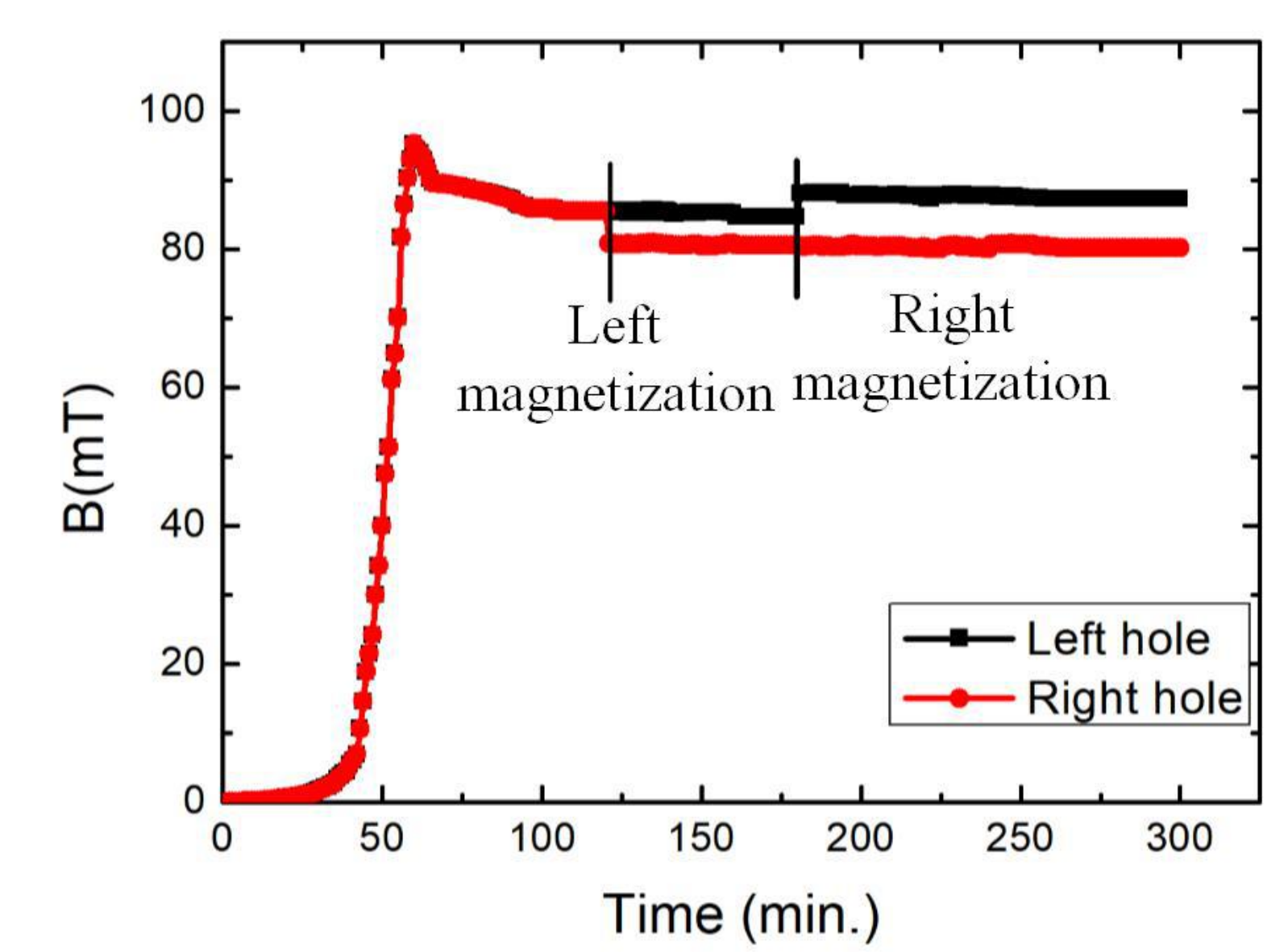


Fig. 7. Central trapped field of two holes in ZFC with inner magnetization.

Experimental Setups

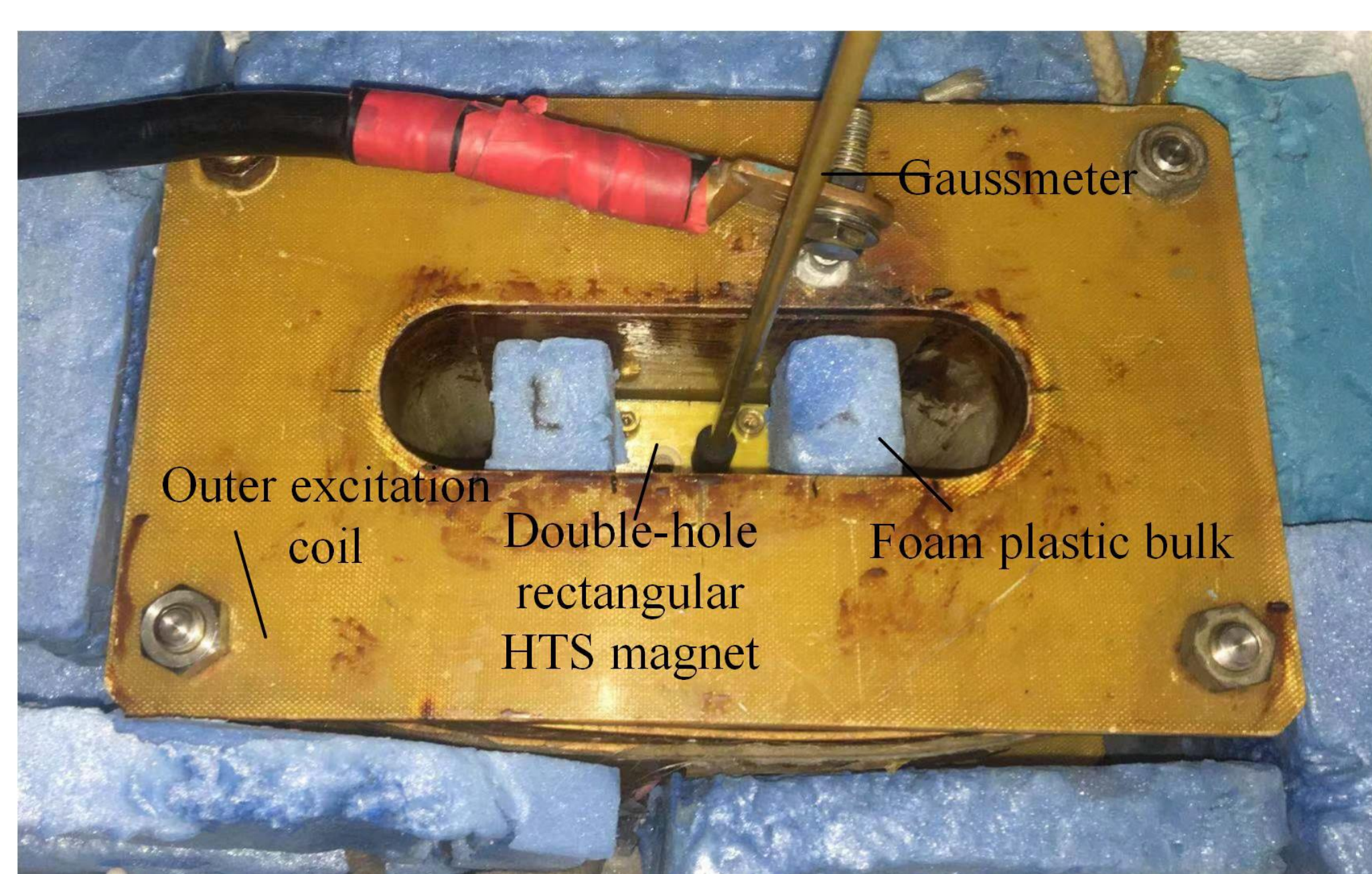


Fig. 2. Photo of FC magnetization or ZFC magnetization with double-hole rectangular HTS magnet.

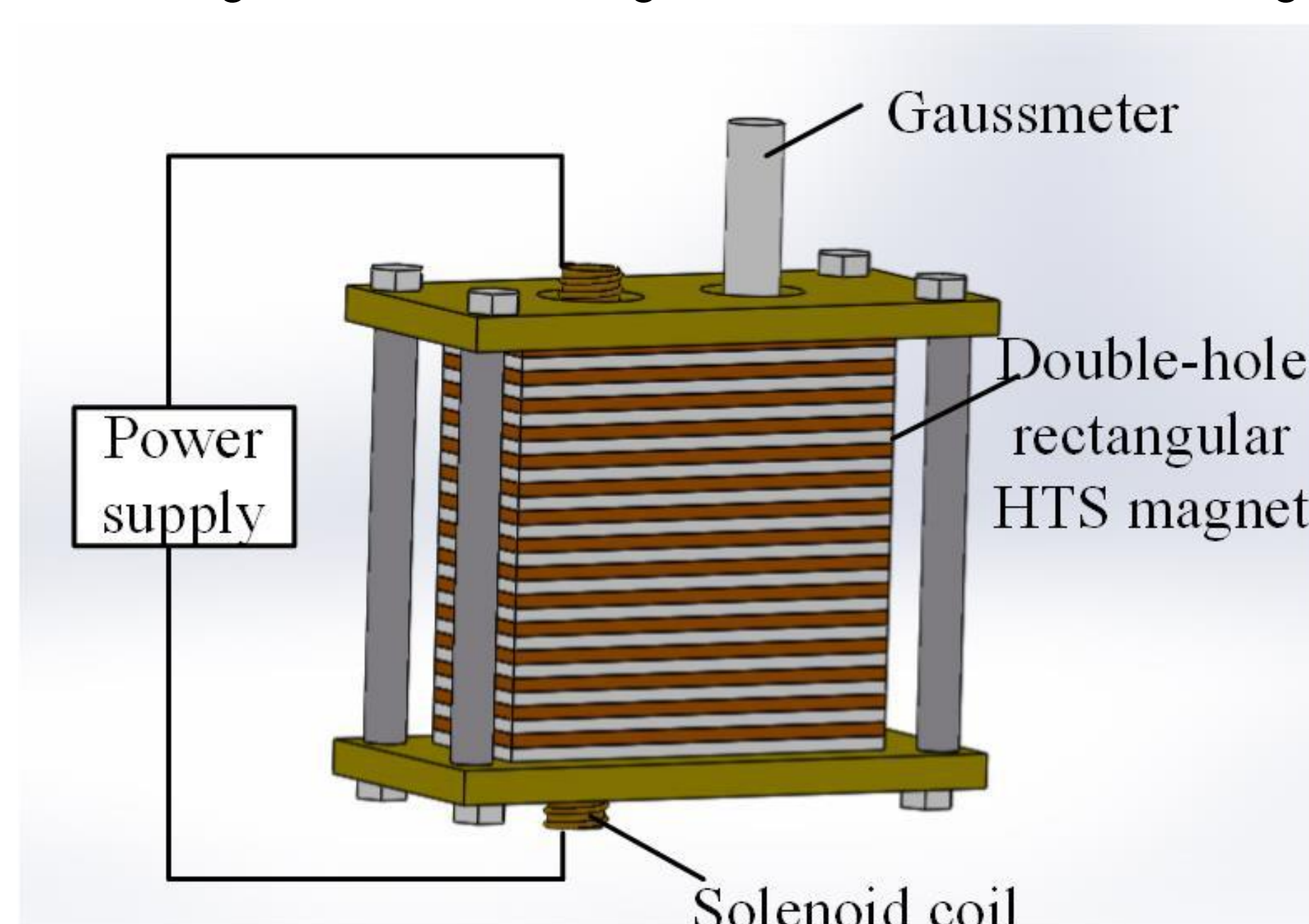


Fig. 3. Schematic view of the inner magnetization with double-hole rectangular HTS magnet.

Conclusion

- 1: The saturated value of trapped field magnetizing by ZFC with inner magnetization or FC with magnetization is higher 15% than pure ZFC or FC magnetization.
- 2: The trapped field of one hole has no effect on the other one.

As represented in Fig. 4 and Fig. 5, the central trapped field using FC or ZFC magnetization is nearly 80% of the background field, which indicates its great characteristics of trapped field in this kind structure. Furthermore, the difference of trapped field by FC and ZFC magnetization is based on magnetization theory. The trapped field by FC magnetization is related to the flux pinning.

Combining FC with inner magnetization or ZFC with inner magnetization is obviously able to increase the trapped field as shown in Fig. 6 and Fig. 7, which is meaningful to further analyze the trapped field characteristics and provide reliable and analytical foundation for further magnetization methods.