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Thu-Mo-Po4.14-04 [111]: Levitation Force Characteristics of High-Temperature Superconducting Bulks in a High Magnetic Field

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The levitation force of high temperature superconducting (HTS) bulks can be enhanced by increasing the strength of the external magnetic field. Many researchers have reached this conclusion by doing experiments above a permanent magnet guideway (PMG). However, the experimental results have limitations because the magnetic field above the PMG is relatively low. In order to obtain more comprehensive levitation force characteristics of HTS bulks, it is necessary to carry out more experiments in high magnetic field. In this paper, we studied the effects of magnetization angle and external field gradient on the levitation force of HTS bulks. We set up a levitation force measurement system based on a 5-T Cryogen-Free Magnet. The HTS bulks were cooled by liquid nitrogen in field-cooling (FC) and zero-field-cooling (ZFC) condition, and the external magnetic field was increased from 0 to 5 T. The HTS bulks were rotated 15° each time and finally rotated to 90°. Experiments show that the levitation force decreases from θ=0° to 90°, where θ is the angle between the upper surface of the HTS bulks and horizontal plane. Relationships between external magnetic field gradient and levitation force as well as magnetization angle and levitation force of the HTS bulks were found in high magnetic field.
Keywords: high temperature superconductor bulks, levitation force, high magnetic field, magnetic field gradient, magnetization angle

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