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Thu-Mo-Po4.13-12 [107]: Investigation of the Levitation Force of High Temperature Superconducting Coils using Wind-and-Flip Method

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High Temperature Superconducting(HTS) magnet has been proved to be a potential candidate for the maglev system because of its stable self-suspension, low energy consumption and adjustable suspension distance. Nowadays studies on levitation force of HTS magnet are mainly carried out in electromagnetic levitation system, which is between YBCO bulks and permanent magnet guideway. In this paper, a special winding technique called “wind-and-flip” was used to fabricate a jointless HTS magnet for a perfect non-resistive closed loop. We investigated the levitation force between wind-and-flip magnet and the cylindrical permanent magnet under zero-field-cooling condition. The relaxation of levitation force at a certain suspension distance was also investigated. Experimental results showed that the hysteresis effect and the relaxation of the levitation force were both related to the vertical suspension distance between the tested magnet and the permanent magnet. Finally, we proposed a theoretical model based on R-L circuit and E-J power law to represent the change process of levitation force. The simulation results obtained by this model are consistent with the experimental data, and on basis of the model, mechanism of the experimental phenomena is also analyzed. Conclusions obtained in this paper has proved that the wind-and-flip magnet is also a possible option for future HTS electrodynamic levitation system.

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