A Study of Dendritic Flux Jump in MgB_2 Thin Film with Varying Magnetic Field Sweep Rate

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Thermo-magnetic instability in the MgB_2 thin film is responsible for dendritic-shaped vortex avalanches, which is closely related to the amount of Joule heating generated by moving vortices. Since a temporal changing of the external magnetic field induces an electric field, which affects Joule heating as a key factor, we investigated magnetic hysteresis loops of the MgB_2 thin film with varying sweep rate of magnetic field at different temperatures. As increasing the sweep rate, noisy region in the hysteresis loop due to magnetic flux jumps is enlarged, while the size of the flux jump is almost constant. Magnetic field versus temperature (*H*–*T*) phase diagram is also obtained to show a threshold behavior near 12 K, which is attributed to the absence of the dendritic flux jump. We conclude that the induced electric field by sweeping magnetic field increases with the sweep rate, resulting into more unstable the MgB_2 thin film.

Keywords: MgB_2 thin film, Dendritic flux jump, Vortex avalanche