Experimental Study of Electric Field Effect on HTS Coils for Superconducting Magnetic Energy Storage Systems in Power Grids

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Abstract: This paper examines the electric field effect on high-temperature superconducting (HTS) coils for the use of superconducting power application. It is obvious that a HTS coil is much less likely to be quenched than low-temperature superconducting coils because of its great volumetric heat capacity at the temperature for practical use. However, in practical superconducting power application such as magnetic energy storage systems, the HTS coils are vulnerable to the mechanical disturbances caused by cyclic and/or unexpected charging-discharging variation. It is of great importance to enhance the safety of the HTS power application with fast response in connection with renewable energy sources. In this study, the electric field effect on the proposed HTS coils was experimentally evaluated. The experimental results show that the proposed one made by the new winding method can be an appropriate candidate for the superconducting magnetic energy storage systems.