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Simulation and Experiment of HTS Coils with a New Structure as Inductors in STRETCH Meat Grinder Circuit

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Inductive pulsed power supplies attract attention from lots of research institutions and scholars since the energy density of inductors is approximately one order of magnitude higher than that of capacitors. Institute for Advanced Technology (IAT) proposed an inductive pulsed power topology named Slow Transfer of Energy through Capacitive Hybrid (STRETCH) meat grinder. In recent years, HTS wire has become sufficiently available to build prototypes and practical instruments. Combining the features of STRETCH meat grinder circuit with the advantages of HTS, we put forward a new structure of HTS coils with transposition method to gain higher pulsed current output. As HTS wire has the advantage of low losses, STRETCH meat grinder modules with HTS coils help to reduce the requirements for the primary power supply, which contributes to the decrease of weight and size of pulsed power system. In the paper, we introduce the design and modeling progress of the new coil structure in detail. Simulation results show that transposition method actually can make current in HTS tapes of parallel-wound coil tend to even distribution. By using the coils with new structure in STRETCH meat grinder, maximum pulse current amplitude of several hundred amperes can be obtained with a high current multiplication factor. Besides, experiments were taken to verify the feasibility of the proposed coil structure.

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