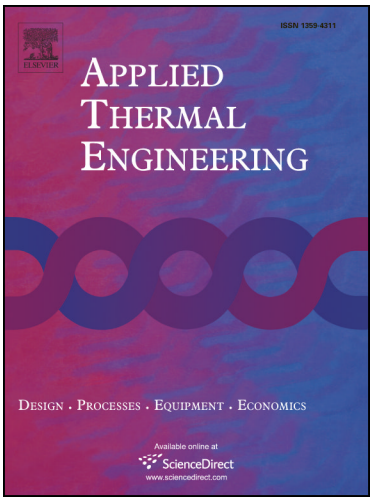

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A Thermal-Stress Field Calculation Method Based on the Equivalent Heat Source for the Dielectric Fitting under Discharging

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Abstract

The discharging in the dielectric fitting can generate thermal shock and thermal stress, which will break the insulation and containment of the dielectric fitting. The discharging process in the dielectric fitting causes the multiple physical field coupling problem, which makes it difficult to calculate the thermal-stress field distribution of the dielectric fitting under discharging directly. This paper proposes a thermal-stress field calculation method of the dielectric fitting under discharging based on the equivalent heat source. In the first stage, this paper considers the discharging in the dielectric fitting as the discharging between a tip and plane electrodes, and builds the magnetohydrodynamic (MHD) model for the arc. In the second stage, an equivalent heat source is proposed to be equivalent to the heat effect of the arc. In the third stage, its accuracy is verified by comparing with the simulation results in MHD model. The results show that the error between the equivalent model and the MHD model is less than 0.3%, which proves that the equivalent heat source can be equivalent to the heat effect of the arc. Furthermore, the equivalent heat source is used to calculate the thermal and stress distributions of the dielectric fitting under discharging. Finally, the experiments verify the feasibility and accuracy of the proposed method.

Key words: Arc discharging, MHD model, equivalent heat source, thermal-stress characteristics

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