Research on heating characteristics and identification method of carbonization defect composite insulators based on electric-magnetic-thermal coupling

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Abstract

When the internal defects of composite insulators develop to a certain extent, it will lead to core rod carbonization which seriously endangers the stable operation of transmission lines. Due to the lack of specific identification criteria, no difference is taken to replace abnormally hot composite insulators in operation at present, resulting in a waste of human and material resources. In this paper, an electric-magnetic-thermal multi-physical field simulation model for core rod-carbonated defective composite insulators was established, and the effects of the location and degree of defects and environmental factors on the surface temperature rise characteristics of composite insulators were studied. Then, the simulation data were deeply analyzed, and the effect of voltage class and air convection was considered. The functional relationship between the position and length of the conductive channel formed by core rod carbonization, and the surface temperature rise of composite insulators was established, and the identification criterion of core rod carbonization heating of composite insulators was proposed. Finally, the proposed thermal identification criterion is verified by the experimental results and the field infrared measurement results. The results of this study can be an effective supplement to the current infrared fever diagnosis methods of composite insulators.

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