Thermo-mechanical modeling of the expansion of a ground electrode made of Copper coated with Inconel 601

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Abstract

This paper proposes a model for the study of an annealing process of a ground electrode made of Copper coated with Inconel 601. The approach is based on thermo-mechanical analysis using Finite Element Method (FEM). The model can be used to investigate the influence of the thermal expansion on gaps formation between Copper and Inconel 601. It is able to calculate the evolution of gap size during heating and cooling, as a function of the temperature and stress throughout a transient analysis done starting from the first phase of the process. An experimental definition of the thermal expansion of both materials was performed. For this purpose, a dilatometry test is done and a temperature dependent thermal expansion coefficient was determined. Data needed for the simulation were taken from literature. An experimental validation is performed at the end. The radiograph was applied to observe gaps appeared and to calculate their dimensions after annealing. It finds that the model is in a congruence with the experimental results.

Keywords: Thermo-mechanical, thermal expansion, expansion coefficient, FEM, gaps, Sysweld®, Inconel 601, Copper, Dilatometry, etc.