Leakage current analysis on 11kV surge arrester design

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Introduction: In surge arresters, leakage current commonly flows across the arrester under normal condition. In this work, the leakage current of 11kV surge arrester was simulated in finite element method (FEM). The influence of insulator shed widths, housing materials and sizes of ZnO in an 11kV ZnO surge arrester design on its leakage current was studied.

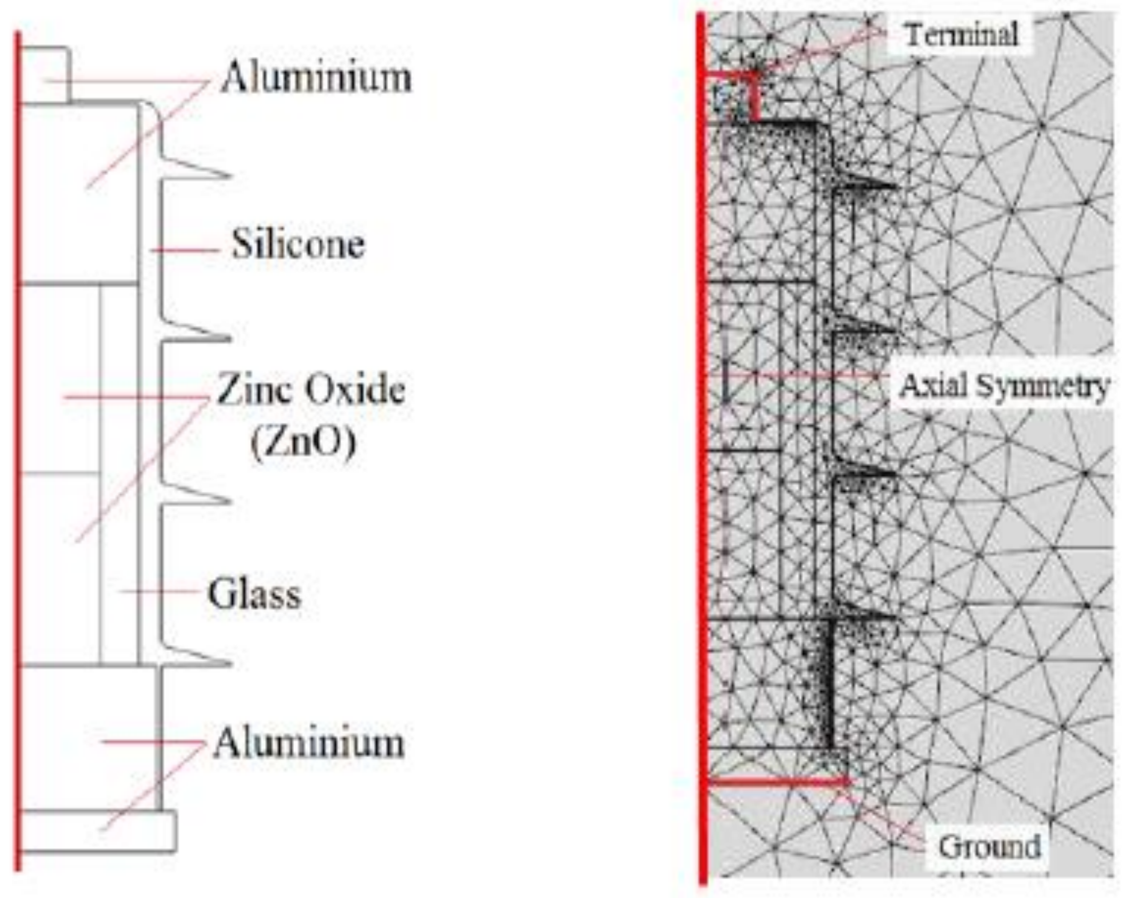

Figure 1. Arrester model geometry and meshing elements

Computational Methods: The physic used in the simulation is electric current module to generate the voltage distribution and current density on the surge arrester. Equations of current density and electric field are used by COMSOL software.

Fig. 1 shows 2D axisymmetric arrester model geometry and meshing elements that was drawn using COMSOL software.

The relative permittivity, ε_r and electrical conductivity, σ were assigned to the materials in the model. Since ZnO blocks are non-linear elements, the electrical conductivity can be calculated using conductivity based on VI characteristics curve during normal condition [1-3].

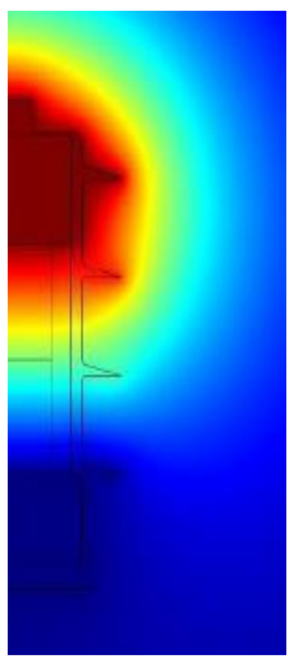

Figure 2. Voltage distribution

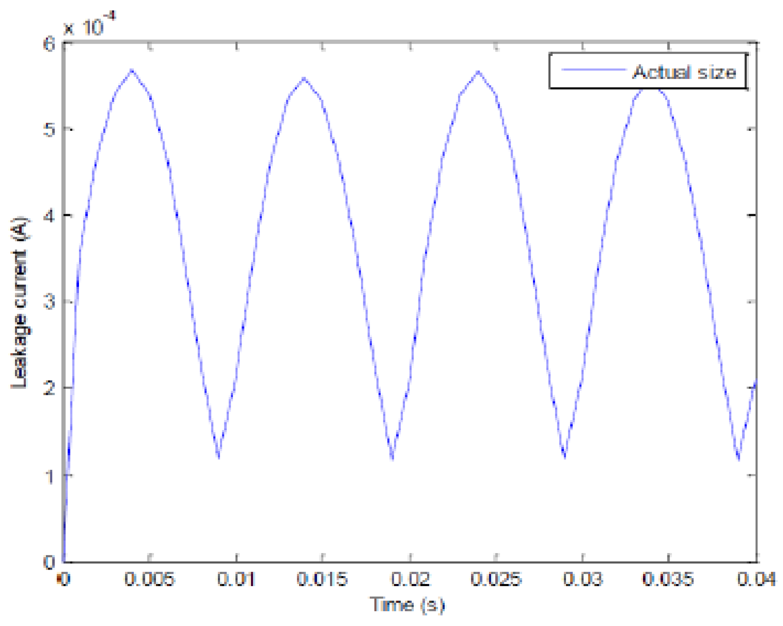

Figure 3. Waveform of leakage current

Results: Fig. 2 shows simulated voltage distribution of 11kV surge arrester silicone-housed and Fig. 3 shows the waveform of simulated leakage current.The parameters of the surge arrester that have been restructured on the surge arrester design are ZnO radius, insulator shed width and housing materials. Fig. 4 shows the results obtained from the simulation.

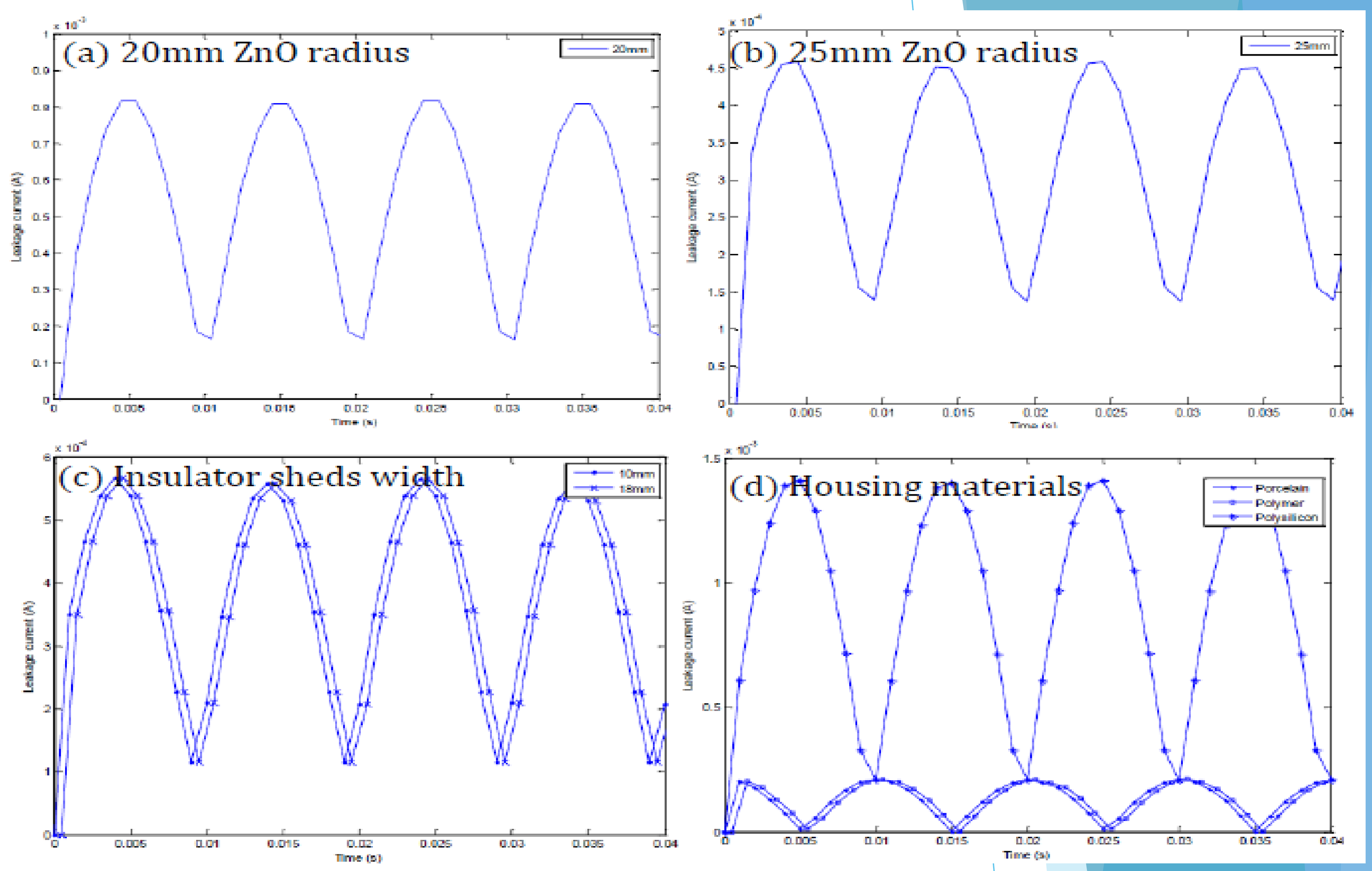

Figure 4. Leakage current waveform for different parameters

Conclusions: It was found that the leakage current is influenced significantly by the sizes of ZnO and housing materials. The leakage current increases when the radius of ZnO decreases and the electrical conductivity of the housing increases.

References:

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