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The numerical model of multi-layer insulation with a defined wrapping pattern immersed in superfluid helium[1] ZIEMOWIT MALECHA, ELIZA LUBRYKA, Faculty of Mechanical and Power Engineering, Wroclaw University of Science and Technology — The numerical model of thin layers, characterized by a defined wrapping pattern can be a crucial element of many computational problems related to engineering and science. A motivating example is found in multilayer electrical insulation, which is an important component of superconducting magnets and other cryogenic installations. The wrapping pattern of the insulation can significantly affect heat transport and the performance of the considered instruments. The major objective of this study is to develop the numerical boundary conditions (BC) needed to model the wrapping pattern of thin insulation. An example of the practical application of the proposed BC includes the heat transfer of Rutherford NbTi cables immersed in super-fluid helium (He II) across thin layers of electrical insulation. The proposed BC and a mathematical model of heat transfer in He II are implemented in the open source CFD toolbox OpenFOAM. The implemented mathematical model and the BC are compared in the experiments. The study confirms that the thermal resistance of electrical insulation can be lowered by implementing the proper wrapping pattern. The proposed BC can be useful in the study of new patterns for wrapping schemes.

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