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# FINATE ELEMENT SIMULATION OF DEFROSTING FROM A PROTOTYPE COOLING PANEL

P.K. Jayakumar, M.R. Jana. & S.K. Mattoo
Institute for Plasma Research, Bhat, Gandhinagar, India
jay@ipr.res.in

Development and characterization of heat facing component is of major interest in fusion research. Several techniques have been used for the functional assessment of the components. These include thermal performance as well as fabrication integrity checks. We report a new technique for the assessment of thermal performance in convection regimes of operation. This technique has been applied on the prototype of a back plate (having 43 numbers of 2mmX 4mm cross section channels embedded on a 6 mm OFHC copper plate), used as a dump for the back streaming electrons (8 $Mw/m^2$ maximum) in the 5 megawatt positive ion source(PINI). A prototype panel with 35 numbers of 2mm x 4 mm embedded cooling channel has been fabricated for this purpose.

The OFHC copper panel has been cooled to $-5\ ^0$ C. The 2mm layer of frost formed has been defrosted by passing water at 22 C. The defrosting pattern shows the $0\ ^0$ C zone of the copper plate. Detailed 3D thermal analysis has been carried out and the time temperature profile has been compared with the recorded video clipping of the defrost. Convection coefficient on each channels estimated by Dittus-Boelter correlation has been applied. The temperature drop of water has been accounted by the calorimetric heating of water and this data has been used to generate the bulk temperature gradient along the length of the channels. The 3D simulation using ANSYS shows good correlation with the experimentally found pattern. This technique of simulating the defrost zone can be used to map the different heat transfer zones on the panel. In addition can be used to assess the effect of complete/partial blockage of the channels on heat transfer performance of the panel.