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DESIGN AND DEVELOPMENT OF AN EMISSIVITY MEASUREMENT SETUP FOR USE AT 100K

Content :

Activated carbon based cryopumps are used in fusion systems, due to their high pumping speeds and the production of clean vacuum. However, for its best performance, the activated carbon should be at the lowest possible temperature during its use. For this purpose, the heat load from the surroundings has to be minimized. While the solid and gas conduction heat loads can be reduced by the careful design of the cryopump and its operating vacuum levels, the radiation heat load can be quite significant and depends on the emissivity of the surfaces. For the best performance of the cryopump, one must ensure that the surfaces of various components are at the lowest possible emissivity. Since the emissivity data are scarce at cryogenic temperatures, we have developed an experimental setup based on the calorimetric method for the measurement of emissivity of various coatings or parts at these temperatures around 100 K. The setup consists of a heater located inside a vacuum vessel at 77K. When the heat transfer between the heater and the receiving surface is nearly by radiation, using the measurements of heat load and the temperatures, the emissivities of the different surfaces can be estimated. The design and fabrication of the experimental setup along with the preliminary results are presented in this paper.

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