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Experimental study of a novel coaxial annular tube convective heat switch

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Thermal switches are used in cryogenic systems to manage temperature, which helps in speeding up the cooling process. The convective heat switch is a thermal switch that controls the heat transfer between different components. Previously, we investigated a thermal switch of a novel structure using CFD methods and gained some helpful information for processing. In this research paper, we determined the structural dimensions of this thermal switch based on simulation results. This thermal switch can be easily machined depending on its design, which holds true during actual processing. We conducted cooling experiments and thermal conductance tests and subsequently compared the results with those obtained from simulations. Furthermore, we have discussed the characteristics of the three phases of the convective thermal switch: initiation, acceleration, and disconnection. This study can help us better understand natural convection at low temperatures.

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