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C2Po1E-02: Numerical study of the heat transfer characteristics of recuperative heat exchangers under intermittent alternating flow

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The recuperative heat exchanger is a key component of the new pulse tube expansion type cryogenic refrigerator, which is tasked with the periodic heat exchange of cold and hot helium, and the thermodynamic efficiency of the entire machine is directly impacted by its heat exchange efficiency. A simulation study is carried out to investigate the heat transfer characteristics of the intermittent alternating flow recuperative heat exchanger by modeling a heat exchanger unit. The instantaneous heat transfer characteristics in the intermittent alternating flow cycle with different wall materials and different inlet mass flow rates of hot and cold fluids are analyzed. The results show that the performance of the heat exchanger is significantly influenced by the wall material and mass flow rate and the heat transfer characteristics are much different between the heating and cooling processes of the mass during the acceleration and deceleration of the alternating flow.

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