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The researches of the thermodynamic cycle in the cold end of the UPTCs through CFD simulation

For U-type pulse tube cryocoolers (UPTCs), the design of the cold end is the key questions for the performance optimization. Some former experimental researches showed us several kinds of design of the cold end of UPTCs. The object of this paper is to compare the different design of cold end of UPTCs to explain the performance differences between them through the CFD simulations. Through CFD method, the thermodynamic cycles of the gas parcels in the cold end are displayed. According to the results, the cold end heat exchanger also has the heat-pumping effect. The coldest position is at the pulse tube near the cold end heat exchanger rather than exactly at the cold end. For UPTC with the design of double cold end heat exchangers, the two cold end heat exchanger acts as two heat resource. The PV power is used to pump heat from the second cold end heat exchangers to the first cold end heat exchanger. Based on these results, some important questions are discussed for the design of the UPTCs.

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