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Adaptation of refrigeration compressors for Joule-Thomson cryocoolers fed with gas mixtures

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Closed cycle Joule-Thomson (J-T) refrigerators supplied with gas mixtures are perspective coolers in many applications requiring low-cost and reliable sources of cooling power below 100 K. They are characterized by relatively simple construction and lack of moving parts working at low temperatures. The refrigerants are composed of nitrogen and hydrocarbons. Working pressure can be as low as about 2 MPa, and thanks to its solubility in hydrocarbons, some fraction of compressor lubricating oil can circulate in the system. The main advantage of the J-T refrigerator using gas mixtures is the possibility of use of commercially available hermetic refrigeration compressors. The limiting factor is temperature increase of the mixture during compression. The paper is focused on the problems of adaptation of hermetic compressors to J-T cryocoolers requirements. Temperature limits as well as possible technical solutions to improve the compressor cooling and lubrication have been analyzed and discussed. Working parameters of the J-T refrigerator fed with gas mixture and will be presented together with the influence of compressor adaptation means.

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