

Experimental investigation of a helium sorption cooler operating below 1 K

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With advancements in space exploration and condensed matter physics, the demand for ultra-low temperature (mK) technology is on the rise. Sorption coolers, known for their extended service life, absence of moving parts, low vibration, high reliability, and immunity to electromagnetic interference, stand out as a crucial refrigeration technology for the future. In this study, we successfully developed a prototype single-stage sorption cooler, utilizing helium-4 as the working gas. The gas-gap type heat switch, independently developed by our unit, operates within the temperature range of 4 K to 20 K, exhibiting switch ratio of 1007 at helium-4 fill pressures of 1 bar. Research findings demonstrate that our prototype sorption cooler can achieve a minimum temperature of 870 mK, with a hold time of 10 hours under no load conditions. To meet the demands for prolonged operation, our unit is actively involved in the development of a continuous sorption cooler.

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