# *Development of Thin-Plate Square-Shape Sorption Compressor for 5 K J-T Cooler*

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A sorption compressor, which utilizes adsorption characteristic, can be applied to a J-T (Joule-Thomson) cryocooler. The adsorbent material which fills the compressor cell can adsorb and desorb the adsorbate according to its temperature. The pressure swings in the cell are, therefore, generated by heating and cooling the cell. In addition, it is necessary to rectify the mass flow from the cell by passive check valves to afford continuous pressure gradient in the J-T cooler. The compressor cell in this paper is designed as a thin-plate shape to minimize the heating and cooling time so that the pressure swing is accelerated. As a result, it can increase the cooling capacity of the J-T cooler by reducing the total cycle time. Furthermore, the thin-plate geometry can take advantage of the fast response to operate without any heat switch to isolate the heat flow during the heating cycle. Its width, height and the thickness are 100 mm, 100 mm and 4.6 mm, respectively. In the cell, cubic pillars with one side length of 1 mm, are arranged to reinforce the structural rigidity and thermal diffusion into the adsorbent. Activated carbon is used in the cell to adsorb and desorb helium for 5 K cooling. For heating the cell, a polyimide film heater is attached to the top surface of the cell. For cooling the cell, the cold head of commercial GM(Gifford-McMahon) cryocooler is thermally connected to the cell via copper thermal link. The commercially available miniaturized check valves are tested at cryogenic temperature and equipped to rectify the gas flow from the compressor cells. The mass flow rate from the compressor and its efficiency are measured to compare the performance with other thermal compressors. Consequently, the strategy to increase the mass flow rate and the efficiency of the compressor are discussed.