An apparatus for the measurements of thermal conductivity and thermal expansion based on GM cryocooler

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The thermophysical properties of matters are extremely important for engineering and materials science. This paper describes a multifunctional apparatus based on GM cryocooler for the measurement of thermal conductivity and thermal expansion using longitudinal heat flow steady-state method and strain gauge technique respectively. It consists of a removable sample test bar on which bulk samples can easily be mounted and then placed in the described measurement device. And also the sample holder is changeable, so different sample holders are designed for different measurements of the above properties. The measurements are rapidly and accurately carried out at different temperatures. A set of stability criteria has been followed during the measurements to ensure the accuracy of the experimental data. The setup of the apparatus is calibrated with stainless steel and the experimental results are within 8% of the published results given in the literatures.