Thesis Title	Construction of an Experimental Set for Determining the Thermal Expansion Coefficient of Metals by Laser Light Diffraction Technique
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Abstract

In this work, an experimental set for determining the linear thermal expansion coefficient (α) of metals using diffraction pattern of light was designed and constructed. The experimental set was divided into three parts: 1) metal rod holder, 2) light source, and 3) heating system. To determine the value of α of a metal rod sample, the metal sample was inserted vertically into a cylindrical plastic pipe with an inner diameter of 16 cm used as a sample holder. A razor blade was mounted on the upper end of metal rod, while the lower end was fixed. The other razor blade was fixed between two posts. Two razor blades were aligned and separated with a distance of 0.5 mm; therefore, the gap between two razor blades acted as a single slit. When a He-Ne laser with a wavelength of 632.8 nm from a light source was passed through the single slit, the diffraction pattern was appeared on a screen. According to designed apparatus, the decrease of the single slit width was equal to the increase of metal rod length due to linear thermal expansion. The decrease in slit width was determined by measuring the distance between central bright fringe and the first order of dark fringe (y). The value of linear thermal expansion coefficient of a metal can be calculated from alteration of y value according to metal rod temperature. In this experiment, stainless steel (314), copper (UNS C11000), and aluminium (6063) rods with an initial length of 45.3 cm were used as samples. The linear thermal expansion coefficient for stainless steel, copper, and aluminium obtained in this work are 15.25×10^{-6}, 17.74×10^{-6}, and 23.13×10^{-6} $(°C)^{-1}$, respectively. These values are in good agreement with the standard ones as reported by the National

Metal and Materials Technology Center (MTEC), Thailand. The percentage error of this proposed method is found to be less than 1.2. It indicates that the constructed experimental set has high accuracy and it can be utilized in laboratory scale or industrial work. Furthermore, this experimental set can be used to demonstrate in physics class for high school students and undergraduates.

Keywords : Aluminium / Copper / Light Diffraction / Linear Thermal Expansion Coefficient / Physics Education / Stainless Steel / Single Slit