

Kosin Wasasiri 2009: Laser Diode Sensors for Measuring Properties of Recycled Plastic. Master of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Ms. Suneat Pranonsatit, Ph.D. 71 pages.

Uncertainty of mechanical properties is one of the obstacles to control quality of plastic products that are partially made of recycled plastic. Generally, mechanical testing is a complicated and destructive method. The purpose of this research was to study an alternative measuring method of mechanical properties. The method should be fast, convenient and non-destructive. The plastic sample products in this study are 32 Polypropylene samples that made from different recycled composition percentages and colors.

A suitable candidate technique for analyzing the difference of the samples is the application of optical transmittance of near-infrared band. A laser diode of 1550 nm wavelength and a photodiode were employed as a light source and optical detector, respectively. The measured results were then used to develop mathematical relationships between optical transmittance and recycled composition, tensile strength and impact strength. Subsequently, the results were compared with those obtained from a spectrometer.

From the experiments, the relationship between optical transmittance and recycled plastic properties, i.e. composition percentages and mechanical properties, can be considered as a linear relationship, with coefficient of determination (R^2) over 0.8. Therefore, recycled composition, tensile strength and impact strength of the plastic samples can be determined by the use of the demonstrated laser diode sensor, with efficiency equivalent to a spectrometer sensing method. The advantages of laser diode sensor are lower investment and maintenance costs, smaller size and lower power consumptions than a spectrometer.

_____/_____/_____
Student's signature Thesis Advisor's signature