Development of Convenient Optical Instruments for Chemical Analysis

Nitta, Yuki (School: Tokushima Prefectural Jonan High School)
Tamano, Hiroto (School: Tokushima Prefectural Jonan High School)

There are two themes in this research. Theme 1 is "a parallel measurement of temperature and the absorbance of chemical reactions accompanied by discoloration", and theme 2 is "simple and accurate colorimetric analysis". We developed our own analytical instruments for each aim. In theme 1, we made an analyzer equipped with a LED light source and a phototransistor detector. Using together our own device which can keep the solution temperature constant, the absorbance at a fixed wavelength can be measured at any temperature and every second. Then, by using this system, the reaction of methylene blue under alkaline condition to form methylene violet at 30 ? over 40 minutes was measured at a wavelength of 625 nm. In Theme 2, a portable colorimeter equipped with a measuring unit, a power supply, and a multimeter was constructed in a small box. The measuring unit consisted of a light source of LED and a phototransistor detector. Then, a pack test was evaluated using the colorimeter. We used the pack test to determine the pH, measured under different conditions. The pH could be determined with high accuracy. In this research, we succeeded in constructing analytical instruments at a low cost. A future goal in Theme 1 is to realize the measurement of changes of absorbance at continuous wavelength under different temperature conditions. And using collected data, to determine the activation energies of various chemical reactions. In Theme 2, we want to improve colorimetry by using mass-produced colorimeters in the field work.

Awards Won: