Drawing a Picture in a Liquid! Novel Photochromic System Using Methylene Blue Reduction With Ascorbic Acid

Nakamura, Fuka (School: Otsumaranzan High School)

I developed a novel photochromic system using methylene blue with ascorbic acid and investigated the optimal photochromic conditions. The photochromic solution is environmentally friendly and can be used as UV detectors, as well as scientific events that focus on photochemical and redox reactions. Particularly, reactions by blue laser pointers are remarkable and enable us to draw a picture in a liquid! This is a new development based on “The Blue bottle experiment”, a popular chemistry demonstration by methylene blue. It was reported in 1954 that the methylene blue solution with tin chloride shows photochromism in which the blue color is bleached by fluorescent lamp and is recovered by near UV light. To achieve my motivation “Drawing a picture in a liquid”, the light source should be coherent light source such as a laser pointer. Commercial laser pointers are visible, therefore I systematically explored the conditions of solution of which the color is recovered by a visible laser pointer. After trying eight different reducing agents, I have found the best condition is the solution prepared by adding 5.0 mL of a 0.0010 mol/L methylene blue solution to 10 mL of a 0.20 mol/L ascorbic acid solution which is environmentally safe. When the transparent solution is irradiated by a blue laser (405 nm) for 10 seconds, the irradiated area along the laser path changes to blue and returns to colorless in 20 seconds. Electrochemical potential and absorption spectra of this photochromism were measured to investigate this novel photochromic system.

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