

Photovoltaic Detection of Hydrogen Peroxide Employing Potassium Ferricyanide as a Catalyst in the Chemiluminescence of Luminol

Jaechang Yang, Semyung Wang and Jong-Hyun Lee^{1,*}

School of Mechatronics, GIST, Gwangju 500-712, Korea

¹Department of Medical System Engineering and School of Mechatronics GIST,
Gwangju 500-712, Korea

(Received October 23, 2013; accepted May 13, 2014)

Key words: hydrogen peroxide, photovoltaic detection, luminol, chemiluminescence, potassium ferricyanide

A photovoltaic measurement system is fabricated to detect hydrogen peroxide (H_2O_2) in a solution based on the chemiluminescence of luminol with potassium ferricyanide and potassium hydroxide as catalysts. A silicon-based positive/intrinsic/negative (PIN) photodiode is employed to quantitatively measure the chemiluminescent light generated from luminol (5-amino-2, 3-dihydro-1, 4-phthalazinedione). Instead of the mixture of luminol and catalysts (MLC) contained in water, the MLC is prepared in powder form enabling H_2O_2 detectability at high concentration intended for agricultural applications. Unlike horseradish peroxidase (HRP), potassium ferricyanide (non-biomaterial) can be stored for a longer period at room temperature without being denatured and without any sophisticated equipment for cooling. For various H_2O_2 concentrations, the peak value, integration value and maximum slope of the output voltage are measured and are discussed in terms of complexity, linearity and measurement speed.

*Corresponding author: e-mail: jonghyun@gist.ac.kr