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Non Dispersive Infrared (NDIR) System for Low Concentration Ethylene Gas Detection.

ABSTRACT - Masterthesis

Large scale and continue distribution of fresh fruit such as banana from producer to customer is necessary. The distribution chain system must guarantee that market obtain unspoiled fruit. One approach to ensure this is by taking out the ripe bananas earlier. Ethylene gas is known as a gas released by rippen banana so that they do not affect and stimulate a rotten process to another bananas. Therefore, early ethylene concentration in small concentration level is designed by utilising Non-dispersive infrared system.

In 2011 NDIR spectrometer has been done by Adam Sklorz. He investigated the shape of chamber for IR-light propagation and calculate the mathematical equation from infrared source and IR-detector parameters in his dissertation. In this thesis, we examine several parameters from commercial detector and test the best one to get as small as possible ethylene concentration level by using the mathematical approach from Sklorz.

By comparing four different commercial detectors of different manufacture, we obtain that TSIX200 model from Microhybrid from calculation has better performance compare to HISE222 of Heimann sensor and TPS434 from Perkin Elmer and from Hamamatsu. By calculation we predict that TSIX200 could reach 2,3 ppm, TPS434 can obtain 24,85 ppm, 8,5 ppm for HIS E222, and 6,4 ppm for Hamamatsu.

In real instrumentation we implement HSL-EMIRS 200 as infrared source modulated with 5 volt square wave, by using conical chamber, and TSIX200 as new detector in this thesis work. We tested the steply by using 100 ppm and 50 ppm ethylene gas concentration.

We obtained the result as that the highest variance, σ, is 2,3 m Volt and more realistic limits are given for $\pm 3\sigma$ minimum concentration resolution is 68 ppm.