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Development of a Low-Cost Spectrophotometric Sensor for ClO_2 Gas JESSICA CONRY, Henderson State University, DANE SCOTT, ALLEN APBLETT, NICHOLAS MATERER, Oklahoma State University — ClO_2 is of interest because of it's capability to kill biological hazards such as E. coli and mold. However, ClO_2 is a toxic, reactive gas that must be generated at the point-of-use. Gas storage is not possible due to the possibility of an explosion. The need to detect the amount of ClO_2 at the point-of-use necessitates a low cost sensor. A low-cost spectrophotometric sensor based on a broad-band light source, a photodiode detector and a band-pass filter is proposed. To verify the design, precise determinations of the gas-phase cross-section and characterization of the optical components are necessary. Known concentrations of ClO_2(g) are prepared using the equilibrium relationship between an aqueous solution and the gas phase. The aqueous solutions are obtained by generating the gas via a chemical reaction and passing it through water. The concentrations of the aqueous solutions are then determined by chemical titration and UV-visible absorption measurements. For the solutions, a maximum absorption is observed at 359 nm, and the cross section at this wavelength is determined to be $4.79 \times 10^{-18} cm^2$, in agreement with previous observations. Using a broad-band source, the absorption of ClO_2 gas is successfully analyzed and concentrations are determined as low as 100 ppm. A more recent prototype based on an UV LED can measure down to concentrations as low as one ppm.

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