Correlation of Chemical Concentration to Color

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Overview

This project was inspired by the need for potable water in many regions of the earth, and it was seen as a way for the team to explore methods for testing for common contaminants that increase the risk of illness due to the consumption of the water in those regions. Using a Chemical Test Strip Reader (CTSR) designed and developed by the members of the project team as a submission for their design project assigned for the course, Principles of Measurement and Instrumentation, the color of reference test sheets was measured in regard to their correlation to chemical concentration. The water quality parameters that were measured include nitrate contamination, free chlorine contamination and acidity/basicity (pH).

Key Findings

This research resulted in the proof-of-concept of the CTSR, confirmed by the correlation of the concentration of the three chemicals tested in relation to the key color parameters for each case, as seen to the left. However, it must be stated that the results were obtained for enlarged reference test strips. To achieve full functionality of the system in the intended application, the optical system of the CTSR must be redesigned in accordance with the area of concern on the test strips.

Impact

With many water purification systems in place around the world, there is a large chance for improper filtration. Access to a system which can provide immediate feedback on the status of water, specific to chemicals that can be harmful or cause illnesses, could have a major positive impact on the state of potable water consumption on earth, specifically in developing regions. Through further research, the presence of additional chemicals or pathogens could be correlated to color and incorporated into the CTSR.

Explanation

The need for potable water in manned space missions is as present as the need on earth. With access to clean water relying solely on engineered filtration systems, it is important to be able to verify the status of the filtered water. Moreover, with the possibility of a complete failure of the filtration system, the astronauts could verify improvised filtration methods through the use of chemical test strips and the CTSR.

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