



## Enhancing a formaldehyde detection workflow using a Nix Color Sensor colorimeter



Formaldehyde (CH<sub>2</sub>O) is a highly toxic organic compound found naturally in the environment and synthesized industrially. Formaldehyde is a valuable chemical precursor used in a wide range of materials such as resins, plastics, textiles, paints, foams, fiberboard, particleboard, and various laminated products. Due to its danger to humans, formaldehyde exposure is regulated by government agencies around the world. For example, the EPA sets strict emission standards for formaldehyde off-gassing from wood composite products, since prolonged exposure can lead to chronic diseases and cancers.

In addition to its numerous applications in the industrial production of materials, formaldehyde has been approved under specific conditions for treating and/or controlling aquaculture diseases. For example, it is approved for inhibiting fungal growth on fish eggs and for controlling shrimp protozoan infections in tanks and raceways. While it has beneficial uses in aquaculture, it has also been reported to be inappropriately used to preserve fish headed to the market. This adulterant extends shelf-life but is extremely dangerous when consumed by humans – causing severe health effects such as cancer over the

long term. Although this formaldehyde adulterating is relatively rare, testing for formaldehyde is increasingly becoming a standard practice.

In order to rapidly and accurately monitor formaldehyde in consumer products (such as seafood), Attogene has developed the Attotector detection kit. Formaldehyde Reaction Powder (FRP) is mixed with the sample which is converted to a vibrant purple-red tetrazine in the presence of formaldehyde. The specific formaldehyde concentration can be determined by directly comparing the color shade to a physical color chart, or by using the optional Nix QC Color Sensor for a more quantitative approach. The Attotector kit is capable of detecting formaldehyde levels as low as 0.1 mg/L (0.1 ppm) in liquid, solid, or gas samples – which is in line with the safety threshold outlined by the CDC and OSHA.

### **What are the benefits of using a Nix QC colorimeter?**

The Attotector kit was originally designed to be used with a paper color card which required the user to rely on their ability to match the liquid sample to the appropriate color. This subjective approach is effective for water samples which are fairly uniform in color, but many sample types (such as fish) have a coloration which impacts the final color of the solution. Thus, color cards are often not appropriate in many cases. The color derived from the sample or even the sensitivity of an individual's eyes can lead to discrepancies in results between users and sample types.

To improve formaldehyde detection capabilities, Attogene teamed up with Nix Sensor Ltd. and their Nix QC Color Sensor. The Nix QC is a low-cost, portable color sensing device which is capable of determining the precise color of any solid, liquid, or powder sample. By connecting to a customizable phone app via Bluetooth, the Nix QC provides a powerful, user-friendly way to solve any color problem. The colorimeter has traditionally been used for a wide range of scientific and quality control purposes in many different industries such as paints & coatings; food & agriculture; building materials; and plastics. When paired with the Attotector kit, the Nix QC removes the guesswork out of color matching to the paper color card – meaning the user can be confident that the precise formaldehyde concentration is determined every time.

## How does it work?

The Nix QC colorimeter is applied to the Attotector workflow as follows:

1. Remove cap from the glass sample vials supplied in the Attotector formaldehyde detection kit.
2. Add sample:
  - a. **FOR LIQUID SAMPLE**  
Add 5 mL of liquid sample directly into sample vial using the supplied graduated 5-mL syringe.
  - b. **FOR SOLID SAMPLE**  
Add 5 grams of crushed or cut sample into the sample vial and add another 5 mL of clean pure water. The cap is added back onto the sample and shaken for 3 seconds.
3. Add 5 drops of a buffering agent (BA) into each vial using the supplied dropper bottle.
4. Add 1 heaping scoop of FRP using the supplied microspoon into each glass vial.
5. Reattach cap and mix by hand for 30 seconds.
6. Incubate at room temperature for 5 minutes.
7. Pour the liquid into the Nix glass cuvette and place into the Nix Liquid Adapter.
8. Hold the Nix QC against the Nix Liquid Adapter and scan.
9. Using L, A, B values, the Nix QC software will automatically match to the closest interval on the Attotector color card to determine the mg/L of CH<sub>2</sub>O
10. This data is logged within the app and can be exported as a .csv file for later analysis.

## How else is Attogene utilizing the Nix QC colorimeter?

- » The use of the Nix QC colorimeter has enabled the accurate, objective detection of formaldehyde in water samples, fish samples, and dirt samples.
- » The same method can be used for the measurement of benzoic acid concentration – a food preservative.
- » Algal concentration in tap water can be determined by measuring minute color changes with the Nix QC after treatment with phosphate buffer saline (PBS). These changes are often not noticeable by eye – meaning a more precise count of algal concentration is possible.