

# Carbamate Analyzer



## 1. Product

Young Lin Carbamate Analyzer

## 2. Purpose

The Young Lin Carbamate Analyzer tests for the presence of carbamate pesticides on agricultural crops, and for Carbamate pesticides in potable and waste water. Carbamate pesticides are a universal pesticide applied to agricultural crops and fields to minimize damage caused by harmful insects and fungi, and to control weeds. Human's exposure to Carbamate primarily occurs by ingestion of fruits, grains, and vegetables that have been treated with Carbamate pesticide during crop production, or indirectly by Carbamate pesticide entering potable water sources used for drinking, cooking, and bathing.

Testing for the presence of Carbamate pesticides on fruits, grains, and vegetables, as well as in potable water sources is important. Carbamate is known as a acetylcholinesterase inhibitor, which leads to increased levels of acetylcholine at nerve terminals. Increased acetylcholine levels can lead to muscle weakness and paralysis. For this reason, a simple and credible high resolution analysis method should be established to test for the presence of Carbamate residues on agricultural crops, and in potable and waste water.

Testing for Carbamate pesticides using Post-column derivatization replaces the GC-ECD method because of an automated sample preparation and analysis procedure that is able to analyze for and to quantify residual traces of Carbamate simultaneously.

There are 13 Carbamate pesticides employed world wide, which are not included in the 10 compounds covered by the U.S. Environmental Protection Agency's (USEPA) Method 531.1 and AOAC Protocol 29.A05.

For instance, N-methyl Carbamate contains the N-methyl Carbamoyl which is extracted with a reverse column. In the presence of a basic environment and high temperature, the molecule decomposes to alcohol, CO<sub>2</sub> and methylamine through hydrolysis.

Isoindole which is a fluorescent molecules is produced by reacting methylamine with OPA or nucleophilic thiofluor. This test satisfies the AOAC Protocol by meeting the requirements of accuracy and precision of USEPA Method 531.1 and A05, when testing for carbamate residues.

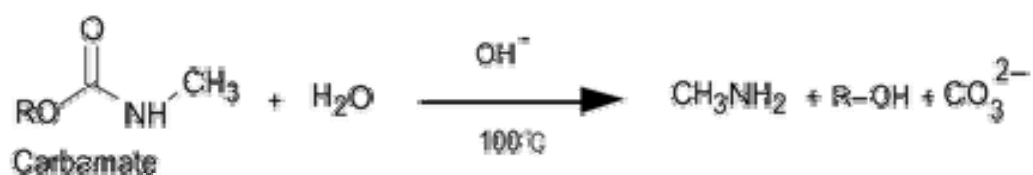
### 3. Principle of analysis

The test for Carbamate pesticides is composed of two procedures. The first procedure isolates samples through a reverse column, while the second procedure is a derivatization through post-column. In respect samples separation, the C18 column employs methanol and water gradient mobile phase to vary the composition's ratio of the eluant and time. A mobile phase condition for samples separation is addressed in 6. References section.

After separation, the eluted sample is subjected to two additional steps: 1) a hydrolysis procedure and 2) a procedure of derivatization.

#### 1) Hydrolysis

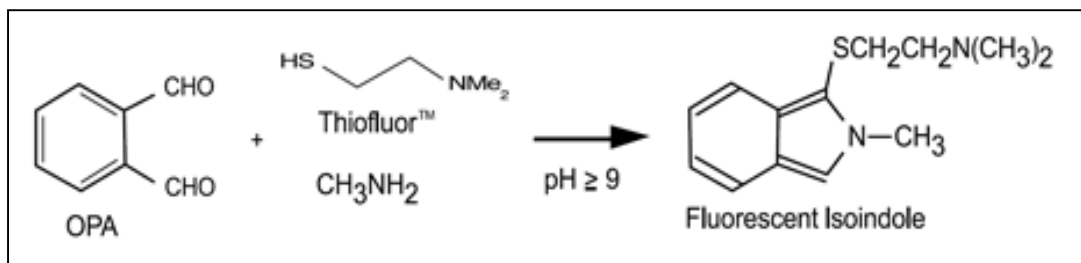
After column separation, each separated constituents of samples decompose to alcohol, carbonate, and methylamine by reacting with NaOH, which is reagent for hydrolysis, at 100°C.



#### 2) Derivatization

Isoindole, which is fluorescent molecule, is produced by reacting methylamine generated via hydrolysis with OPA reagent or Thiofluor.

#### Procedure of Derivatization for Carbamate Pesticide



### Derivatization Condition

Reagent 1 : 0.05 N NaOH

Flow rate : 0.3 mL/min

Reactor 1 : 500uL, 100 °C

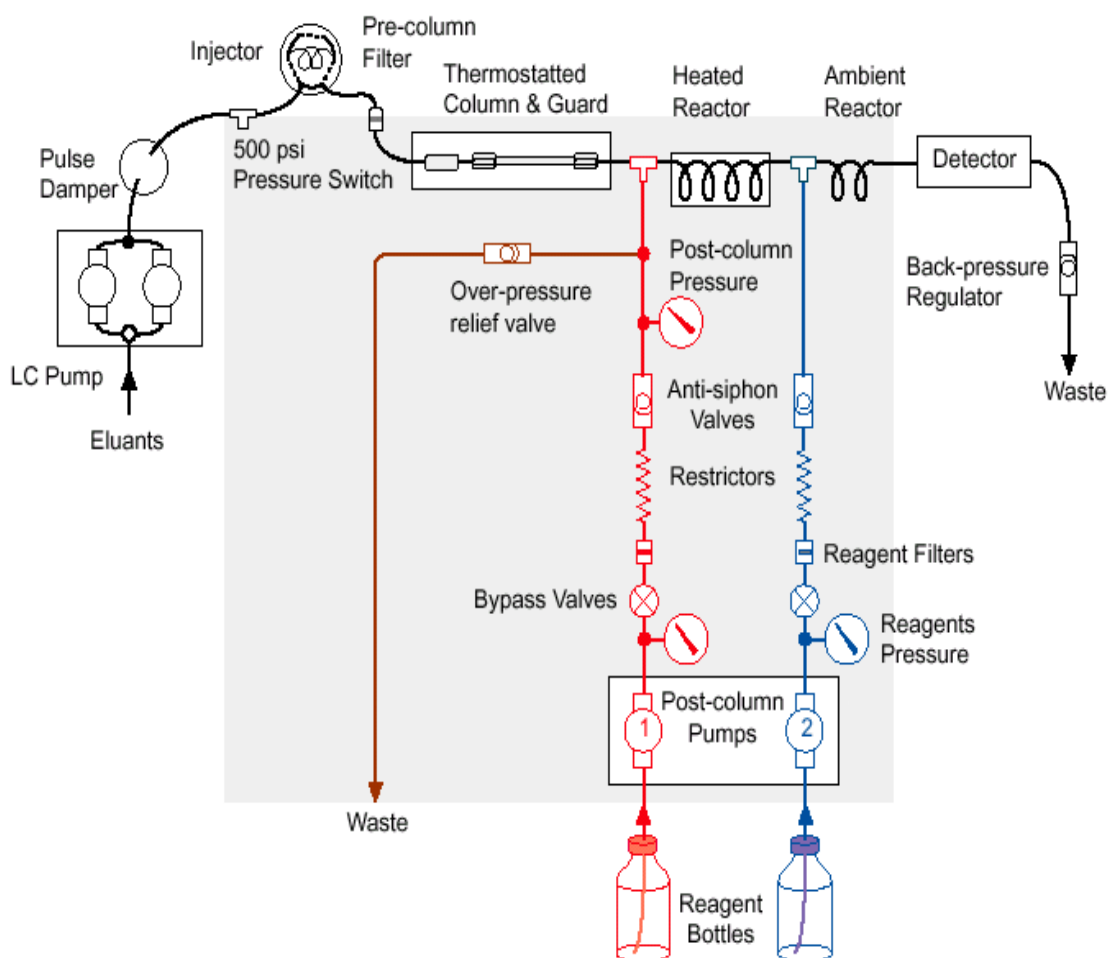
Reagent 2 : OPA & Thiofluor

Flow rate : 0.3 mL/min

Reactor 2 : 100uL, Ambient

Carbamate pesticides isolated through the procedures of separation, hydrolysis, and derivatization are detected by excitation/emission at UV wavelengths 330nm and 465nm respectively. (see Figure 1 below).

### The Young Lin Carbamate Analysis System's Configuration



## 4. System Configuration

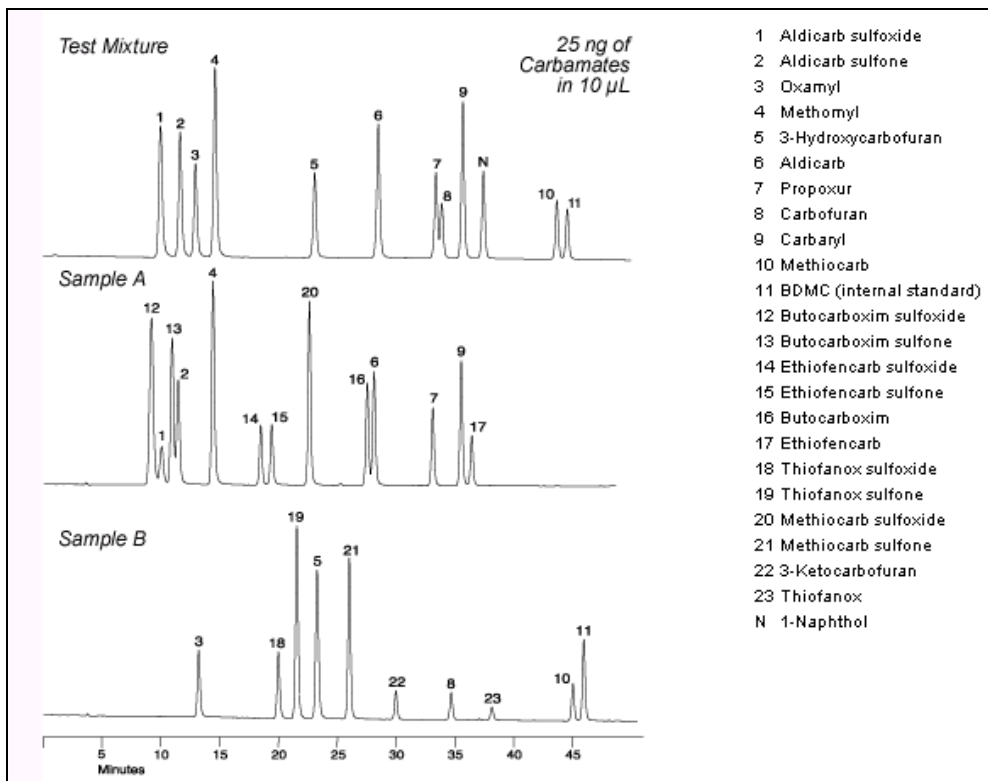
### Equipment

- (1) Post-column derivatization system
- (2) Solvent delivery module
- (3) 4 channel vacuum degasser & mixer
- (4) Fluorescence detector(For OPA )
- (5) Manual Sample Injector with switch
- (6) Data system
- (7) Application kit for Post-column derivatizaion
- (8) Autosampler (Option)

## 5. Features

Features	Advantages
Support analysis methods and procedures	Provides efficient, accurate, and reproducible results
System control through software	Strengthens convenience of analysis
High system effectiveness	Simple analysis testing for the presence and concentration of Carbamate using one-kit

## 6. References



TIME	WATER	MeOH %
0	85	15
2	85	15
42	30	70
46	30	70
46.1	0	100
51	0	100
51.1	85	15
59	85	15

Carbamate analysis: conditions and chromatogram

## 7. Application Field

- Vegetable matter
- Testing of agricultural crop
- Testing of potable water sources