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Rapid Analysis of Carbamate Pesticides Using the Hitachi LaChromUltra™ Liquid Chromatography System and Sensivate Elite™ Post Column Reactor

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Carbamate pesticides are broad spectrum pesticides used to control a wide variety of insect pests on crops. Due to their ubiquitous use and acute and chronic toxicity to humans and the environment, the EPA monitors the levels of carbamates in ground and drinking water. Monitoring the levels of carbamates in water run-off and water supplies is a major concern of environmental agencies in both agricultural and urban areas.

EPA method 531.1[1] describes the analysis of carbamate pesticides via chemical derivatization followed by low level analysis with fluorescence detection. The most commonly analyzed carbamates are: Aldicarb, Aldicarb Sulfone, Baygon, Carbaryl, Carbofuran, Dioxacarb, 3-Hydroxycarbofuran, Methiocarb, Methomyl, and Promecarb. Derivatizing these compounds through exposure to a hydrolyzing reagent followed by reaction with o-phthaldehyde and thiofluor greatly enhances the sensitivity of this analysis[2]. Using a 2.7-µm particle size column the LaChromUltra liquid chromatography system coupled with the Sensivate Elite post-column reactor achieves analysis faster than previously shown. The post-column derivatization is carried out using standard reagents described in EPA Method 531.1, but shows faster throughput (15 minute analysis vs. competitor's 41 minute analysis time).

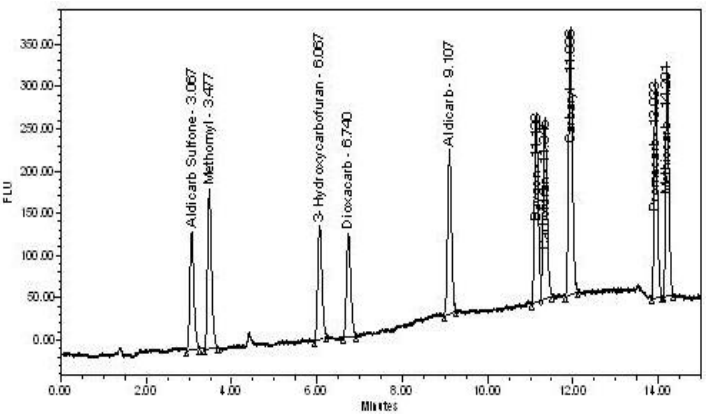
Experimental Conditions

Module	Conditions and Other
Pump (L-2130U)	See gradient profile
Autosampler (L-2200U)	2 µL injection volume, of 10 Carbamates Mix diluted to 1µg/mL in acetonitrile, 10°C
Column Oven (L-2300U)	42°C
FLU Detector (L-2485U)	Excitation: 330 nm; Emission: 440 nm
Column	Supelco® Ascentis® C-18 4.6X10 mm, 2.7 µm Column
Standards	Chem Service mixture of Carbamates CP8318

Solvent Gradient Profile

Time	% water	% acetonitrile
0	90	10
6	80	20
12	55	45
12.1	45	55
14	35	65
14.1	10	90

Results



Discussion

Hitachi's LaChromUltra Liquid Chromatography System, equipped with a 2.7µm particle size column and Sensivate Elite post-column reactor, reduces the analysis time for carbamates by up to 3 times. The LaChromUltra is designed to take full advantage of the increased efficiency associated with smaller particle sized columns and the Sensivate Elite automates the derivatization of carbamates to fluorescent compounds. Together, the LaChromUltra and Sensivate Elite systems increase the overall throughput of samples, while decreasing the error that might occur with non-automated post-column reaction systems.

References:
1- USEPA Official Methods 5 and 531.1 and AOAC International Protocol 29.A05, United States Environmental Protection Agency, 1989.
2 – Pickering Laboratories, Inc. Application Manual on Carbamate Analysis, ver. 2.0, July 2002.

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