A new automatic online detector for determination of benzoyl- and phenylurea pesticides in natural waters

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Introduction

We worked previously on an online automatic detector for the determination hydrocarbons in aqueous medium by fluorescence detection to monitor pollution in natural water [1]. We worked also on photo-induced fluorescence (PIF) methods based on UV irradiation (classical PIF) and laser irradiation (DL-PIF) for the quantitative determination of pesticides in natural waters [2-3]. In this present work, we have associated these two technics to propose a new automatic on-line detector by PIF method (namely "AUTOPIF") for the monitoring of pesticides in natural waters. Two evolutions of the system are studied and compared, and then applied to the detection of benzoyl- and phenylurea pesticides (diflubenzuron, fluometuron and monolinuron) in natural waters.

Materials and Methods

A peristaltic pump (Gilson Minipuls 3), is used to carry and regulate the liquid flow. Photoproducts were formed in a 25 mL flow quartz tubes under irradiation of a 300 W UV lamp. Fluorescence was detected after excitation at 280 nm by the UV diode throw a quartz flow cell. The fluorescence is then collected by two optic fibers.

"AUTOPIF" is derived from a commercial AQUAPOD system (HOCER, France) where the detection is done by diode array spectrometer (Oceans Optics).

"AUTOPIF+" is equipped with a SpectraPro-550i spectrometer (Acton, MA, USA), and a CCD intensified Camera (Princeton instruments, NJ, USA).

Results and discussion

For DFB, only one fluorescence photoproduct was detected at 410 nm by AUTOPIF+ and is not detected by AUTOPIF because its scanning range is limited between 200 and 400 nm. Same photoproduct was detected by Diaw et al. [1] during determination DFB in mixture water/methanol (30/70, v/v) at pH 4 under UV irradiation. For MLN, one fluorescence photoproduct was detected by AUTOPIF and AUTOPIF+ with peaks emission ranged of 342 nm to 350 nm. This emission wavelength is characteristic of aromatic amines as aniline and its derivatives [4]. FLM PIF was detected at 370 nm and 420 nm, respectively for AUTOPIF and AUTOPIF+ methods. Analytical performances of AUTOPIF and AUTOPIF+ methods were satisfactory with relative low limits of detection.

Conclusion

The fluorescent photoproducts of MLN, FLM and DFB are successfully determinate in aqueous medium. AUTOPIF and AUTOPIF+ methods are then suitable to determine phenylurea pesticides in river, and tap water samples. AUTOPIF + method give best result with great sensibility due to by the CCD intensified camera. LOD were relatively lowest and the recovery rates found for are satisfactory and range between 98 and 108% and belong to the area of validity of the analytical method.

References

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