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PERFORMANCE OF CANDIDATE DETECTORS FOR MULTIRESIDUE ANALYSIS OF PESTICIDES IN WATER BY COMPREHENSIVE TWO-DIMENSIONAL GAS CHROMATOGRAPHY

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The determination of pesticides in water samples is challenging and requires the development of highly resolving and sensitive multiresidue methods. Due to their enhanced peak capacity and the sensitivity of cryogenic modulators, comprehensive two-dimensional gas chromatography (GC×GC) systems are well suited for multiresidue analysis in food or environmental samples. Apart from TOF-MS which is often presented as the gold standard detector to hyphenate with GC×GC, several cheaper solutions like Flame Ionization Detector (FID), Flame Photometric Detector in phosphorus (FPD/P) or sulphur modes (FPD/S), Nitrogen Phosphorus Detector (NPD), and Electron Capture Detector (µECD) can be considered as viable alternatives for pesticide determination.

The aim of the present study was to discuss the relevance and the complementarities of FPD/P, FPD/S, µECD, NPD, FID and TOF-MS for the GC×GC analysis of a mix of 60 pesticides including organophosphorus pesticides, synthetic pyrethroids and fungicides. After optimization of the GC and GC×GC setting (including column set and modulation period), the two configurations were assayed using 11 concentrations of the pesticide mix ranging from 0.1 ng/mL to 2 μg/mL in hexane. The relative performances of the GC×GC systems were benchmarked in terms of linearity, R², LOD, LOQ on a selection of compounds including phosphorus, sulfur, nitrogen and one or several halogenated constituents detectable by all the configurations and compared to GC data. The GC×GC suitability of each detector, and their potential complementary attributes, are discussed based on the qualitative comparison of the contour plots of the full mix, and examination of the GC signal in terms of peak width and
peak symmetry. The controversial issue of sensitivity enhancement in GC×GC was considered for optimised GC and GC×GC operation.