Optimisation of an Analytical Technique for Studying $^{14}CH_3Hg^+$ Demethylation Potential

VESNA JEREB

Abstract: Radiotracer $^{14}CH_3Hg^+$ is used to follow demethylation products $^{14}CH_4$ and $^{14}CO_2$ which indicate the detoxification mechanisms. In general, two approaches are used to measure CO_2 and CH_4: (i) separation of gases on gas chromatoraphy coulmn followed by detection in gas proportional counter or (ii) trapping of products into an appropriate absorption solution followed by liquid scintillation counting (LSC).

We prepared a simple system to follow $^{14}CH_3Hg^+$ demethylation by using Packard Tri-Carb 2550 A/B LSC. The gaseous products from $^{14}CH_3Hg^+$ demethylation were trapped in NaOH solution and counted on liquid scintillation counter after the addition of scintillation cocktail. CH_4 was combusted to CO_2 in CuO column at high temperature prior to trapping in NaOH solution. Analytical parameters such as counting efficiency, NaOH trapping efficiency, quenching effects, repeatability and limit of detection were determined by varying experimental factors (such as flow of purging gas, concentrations and volumes of NaOH solutions, sample / scintillation cocktail mixing ratios etc.).

For this demethylation experiments, soil sample IAEA Soil-1 was tested. Sample was spiked with different amounts of $^{14}CH_3Hg^+$ radiotracer of high specific activity and incubated in dark for several days at room temperature and under anaerobic conditions. Results of the study suggest reductive demethylation in soil, as the oxidative reductive demethylation potential ratio was about 0.1.

Key words: $^{14}CH_3Hg$ demethylation, liquid scintillation counting