

Holistic approach to the assessment of anthropogenic contaminant stressors in the aquatic systems and atmosphere

PhD. Per-Anders Bergqvist, PhD. Audrone Zaliauskiene***

**Umeå University, Department of Environmental Chemistry, Sweden*

*** Exposmeter, Sweden*

Abstract:

During the last decades knowledge on and awareness of persistent organic pollutants as environmental hazards increased considerable, followed by international agreements such as UNEP Stockholm convention on persistent organic pollutants (POPs) to minimize further release of POPs into environment (UNECE Protocol, 1979; UNEP Stockholm convention; UNECE Convention, 1998). Information presented in POPs environmental monitoring reports is usually based on total concentrations of chemicals and is used to describe environmental risk of POPs release. Exposure expressed as total chemical concentrations does not address the actual exposure to organisms and are thus difficult to use in risk characterization. Pollutant concentrations in environment fluctuate very rapidly depending on occasional releases and rain events. It is thus important to assess the time weighted average (TWA) concentration of potentially toxic compounds in order to describe the exposure to organisms living in the watercourse. Use of Passive sampling is one way to assess TWA of dissolved concentration of non polar (e.g., PCBs, PAHs, PCDF/Ds, pesticides, flame retardants, alkylphenols, phtalates, chloroparaffins), polar compounds (e.g., herbicides, new generation pesticides, and pharmaceuticals related chemicals) and metals. During the last decade many research groups have been working on development of passive sampling methods such as SPMDs (semipermeable membrane devices), SPME (solid phase microextraction), DGT (diffusive gradients in thin film), and POCIS (polar organic chemical integrative samplers) that would comply with these requirements.

POCIS (Exposmeter-Hydrophilic) is applied for determination of the time-weighted average concentration of polar chemicals in water during three weeks. Device can be calibrated for use as a quantitative monitoring tool for polar organic chemical residues dissolved in a wide variety of aquatic ecosystems. Device comprises a sealed microporous hydrophilic polymeric membrane enclosure containing a mixed sequestration phase capable of transforming the dissolved polar organic chemicals into non-mobile (sorbed) species, which accumulate in the device throughout the exposure time. SPMD is a passive, integrative tool for measuring toxicity and concentration of non-polar organic compounds in water, air and soil. The technique is based on a simple device which accumulates the compounds in a lipid phase after passage through a diffusion membrane layer. The compounds can subsequently be analyzed employing toxicity tests or GC-MS or other instruments. The simple device can readily be deployed in-situ in streams, lakes, rivers or effluents and sampling is independent of flow.