Highlights of <<Passive Sampling: effective sensing of environmental quality>>

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Dear colleagues,
A month ago I defended my thesis at the Vrije Universiteit Amsterdam titled: *"Passive Sampling: effective sensing of environmental quality"* receiving a doctoral degree. The presentation at the defense was a 9.5 minute talk for layman but this presentation is more highlighting the science and result of my lifelong mission, or maybe passion, i.e. the attempt to assure that measured monitoring data are meaningful and comparable in time and space. Although this started with analytical quality assurance of the analysis of hydrophobic contaminants (HOC) like PCB, PAH, etc. in water and sediment, I, however, rapidly learned that knowing the exact HOC concentration in a matrix is of limited value when properties of that matrix are undefined and vary in time and space. In water, the freely dissolved HOC concentration relates to solubility, a well-defined property, but we were not able to find a way to unambiguously isolate pure water from the whole water sample.
For sediments I worked for many years on improvement of data comparability by measuring HOC concentrations in fine-grained fractions after wet sieving. Resulting fine-grained fractions indeed had more similar physical composition, but the material's nature remained ill-defined and variable. HOC concentrations in organisms depend on so many factors that obtaining comparable samples over time and space is virtually impossible.
Although partitioning passive sampling of HOC using polyethylene or silicone sheets is generally known as a method to measure freely dissolved HOC concentrations, for me passive sampling is inserting a "compartment" with defined and constant properties into the environment consequently providing data on a comparable basis.
HOC concentrations in passive samplers, equilibrated with different environmental matrices, represent HOC levels in equal units of ng/g sampler which can be simply converted to concentrations freely dissolved in water, equivalent concentrations in lipid, or another relevant matrix. For HOC concentrations I am strongly in favor of conversion to a lipid basis. HOC's lipid-based concentrations have comprehensible units and can be compared to those for organism (e.g., fish). The Lipid-based levels derived from water essentially represents the external HOC level organisms are exposed to. This external exposure level includes HOC that are metabolized and therefore neglected if relying on analyses of organisms.
The outcome of my work is a scientific confirmation that aqueous monitoring and assessment of HOC levels can conveniently be performed by passive sampling with an equal level of protection. The method demonstrated a lower data variability compared to HOC monitoring in fish sampled following currently applied technical guidance 32 in the Water Framework Directive.