

# Optimisation, calibration and field testing of passive sampling devices for monitoring of polar organic compounds

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The concept of passive sampling, where sampler accumulates compounds from sampled medium passively via diffusion, has been extensively developing over last decades and is nowadays commonly used in monitoring of trace contaminants in the environment. However, passive samplers for polar compounds in water pose a challenge, as their use is limited due to effect of hydrodynamic conditions, especially water flow rate, on uptake of compounds. Hydrogel-based samplers were recently introduced as a possible solution to the issue. The samplers contain thick diffusive layer of hydrogel with properties similar to stationary water, thus minimising the effect of water flow rate on sampling.

Suitability of 1.5% agarose hydrogel as a diffusive medium for diverse group of emerging polar contaminants (currently used pesticides, pharmaceuticals, personal care products and perfluorinated compounds) was tested. For most compounds, no sorption to pure hydrogel was found. Diffusion coefficients in hydrogel were measured at different temperatures, which allows the prediction of sampling rates even without further calibration. Diffusion coefficients of few selected compounds were also measured in water with comparable results. 1.5% agarose hydrogel thus proved suitable for use in a passive sampler.

Agarose hydrogel sampler based on diffusion gradient in thin films (DGT) with Oasis HLB sorbent and sampling area of 3.1 cm<sup>2</sup> was calibrated in laboratory conditions. The overall sampling rate was too low, reaching values down to 1.1 mL/day. Therefore, a novel sampler design was proposed, with the sampling area of 22.7 cm<sup>2</sup>. This design was tested on several field locations and compared with other passive samplers, spot samples and composite samples. Findings prove that the novel agarose hydrogel-based passive sampler can be reliably used for monitoring of spatial trends of water contamination by trace pollutants and determining time-weighted average water concentration values below ng/L.