Application of the Steam Jet Aerosol Collector (SJAC) for the semi volatile organic compounds gas / particle portioning measurements

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Aerosol collection, especially for semi volatile compounds, is subject to significant artefacts due to evaporation, adsorption processes and chemical degradation. Nevertheless, since both health and ecological impacts of certain compounds depend on their appearance form it is very important to distinguish between their concentration in the gas- and particle phase. Therefore, finding a proper sampling technique is not an easy issue.

The Steam Jet Aerosol Collector (SJAC) was originally designed for the online determination of inorganic compounds from the particle phase (Slanina *et al.*, 2001). In our work we concentrate on the adaptation of the original SJAC for sampling organic compounds in both particle and gas phase.

Particle collection efficiency was examined with different non-polar particles by means of Scanning Mobility Particle Sizer (TSI Model 3936 SMPS) and the optimum working conditions were obtained for two kind of regarded steamers. The applied cyclone with preceding mixing chamber working with original boiling pot were found to remove over 99% of graphite particles (Palas Generator GFG 1000) as well as octacosane-particles from homogeneous nucleation of the gas phase and candle- soot particles. Application of alternative steam injection technique yielded in much lower particle collection efficiency ca. 66% of particle number.

Pure gas phase streams of four individual organic compounds (heptadecane (1), undecanol (2), naphthalene (3) and methoxyacetophenone (4)) were applied in order to estimate the amount of bias caused by the transfer of components from gas phase to the particle fraction. The water solubility of these compounds was in the range from $3*10^{-4}$ for heptadecane to $2*10^{3}$ mg/l for methoxyacetophenone (see Table 1).

Table 1: Water solubility and K_{ow} values for the organic test compounds.

Substance No.	Water solubility (mg/l)	Log P (octanol-water)
1	0.00029	8.7
2	19.1	4.3
3	31	3.3
4	2030	1.8

The concentration in the particle fraction varied from below 0.1% of the gas sample for heptadecane to below 3% for methoxyacetophenone (see Fig. 1).

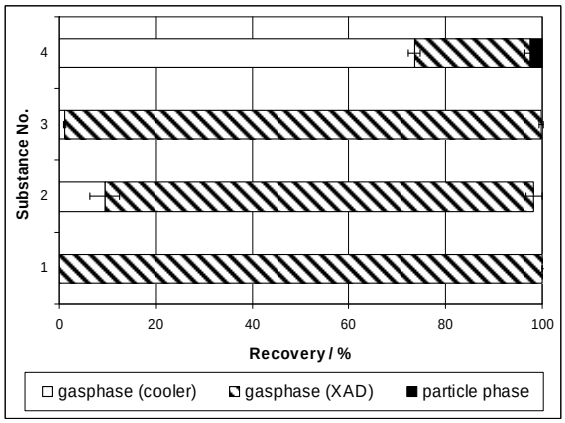

Figure 1. Average fractionation of gaseous test compounds between the three samples (gas phase 1, gas phase 2 and particle phase of the modified SJAC during gas phase measurements;

The analytical procedure includes the liquid-liquid extraction with dichloromethane (for water samples) and Accelerated Solvent Extraction (ASE) with acetone/hexane mixture (for XAD4 samples) both followed by cleanup, evaporation and GC-MS analysis.

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