Collection of CAST soot particles with a Particle into Liquid Sampler (PILS)

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Particle-Into-Liquid Samplers (PILS) are used to collect aerosols into liquid samples for further investigation, such as, liquid chromatography (Sorooshian et al., 2006). A PILS uses high supersaturations to activate water soluble particles to droplets, which are collected at an impaction plate and rinsed off by a wash flow, which is subsequently collected in a suitable vial.

In this study, the sampling characteristics of a PILS (Brechtel, Model 4001) are investigated for soot particles, which are known to be water-insoluble, but may be wettable.

A miniCAST burner (Jing Ltd) is used to produce propane soot with varying C/O ratios, which is sampled both with a filter sampler and, after a dilution step, the PILS. The experimental setup is shown in Fig. 1.

An integrating sphere technique is used to determine black (BC) and brown carbon (BrC) both in the filter and the liquid PILS samples (Wonaschuetz et al., 2009). The filter samples are also analyzed for elemental (EC) and organic carbon (OC) using a thermal-optical technique (Sunset Analyzer, Sunset Labs, Inc.) with the EUSAAR 2 protocol (Cavalli et al, 2010). So the transfer of soot into the liquid PILS samples can be investigated both in terms of BC/BrC and EC/OC; also as a function of the C/O ratio in the miniCAST, which strongly influences the composition of the produced soot (Kim et al., 2015).

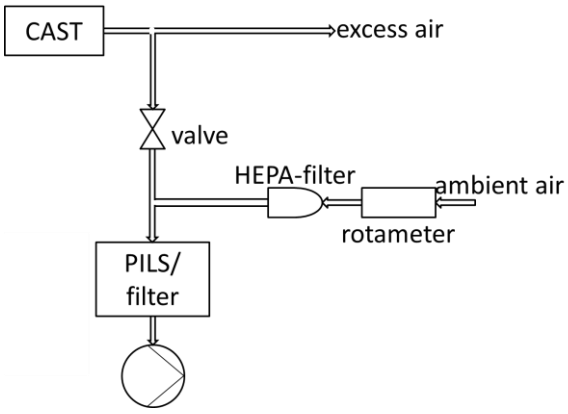

Figure 1, Experimental setup

The experiment is performed several times for soot produced in the miniCAST with varying C/O ratios

First results show that contrary to expectations, soot is indeed transferred into the liquid samples obtained from the PILS. Sampling efficiencies for BC range from about 1% to more than 10% (see Figure 2).

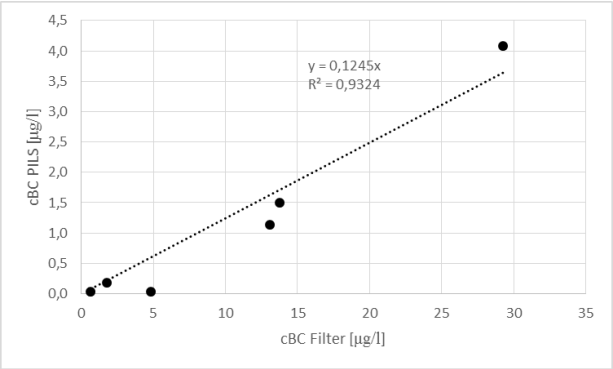

Figure 2. BC concentrations measured in PILS samples vs. BC concentrations on filters.

Size selective measurements will be performed to investigate a possible size dependence of the transfer efficiency. Further investigations will be performed also to determine the transfer efficiency of miniCAST soot in terms of EC and OC using filter samples analyzed with the thermo-optical method.

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