JOINT FINAL EVENT

PaREGEn + PEMs 4Nano

Semi Volatile Mass Detector

Objective

detection of semi-volatile particulate matter and particularly, although not exclusively, to the detection of one or more characteristics of such particulate matter such as mass concentration in a flowing gas.

Working principle and methodology

A semi-volatile particulate matter detection device for detecting semi-volatile particulate matter in a gas flow, consisting of a first filter stage for receiving the gas flow, a conveyance section to convey the gas flow and the semi-volatile vapour and a second filter stage to receive the flow from the conveyance section. An integrated detector will be used to measure the condensed semi-volatile particulate matter vapour on the second filter stage. The present apparatus allows for consistent and systematic measurements of semi-volatile species.

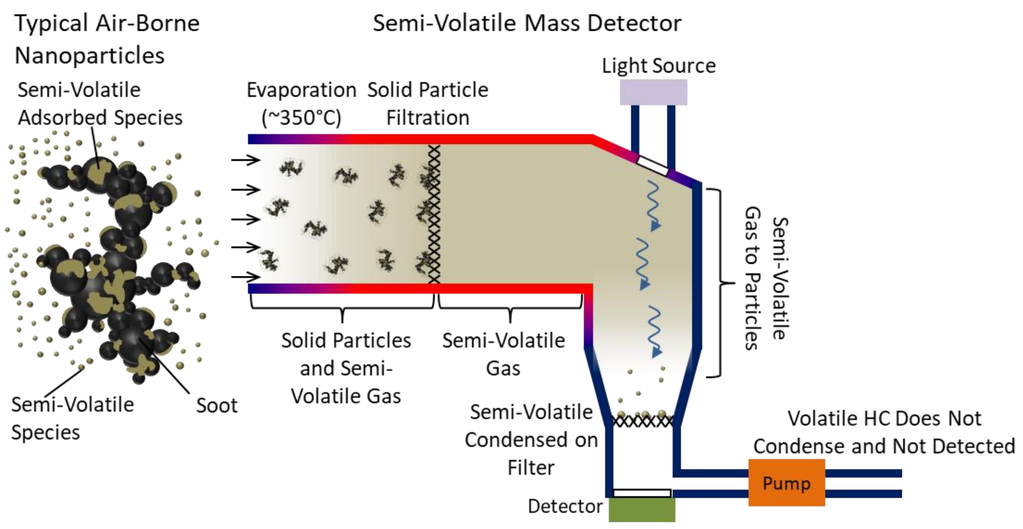

Fig. 1 - Schematics representation of Semi Volatile Mass detector working principle

Modelling

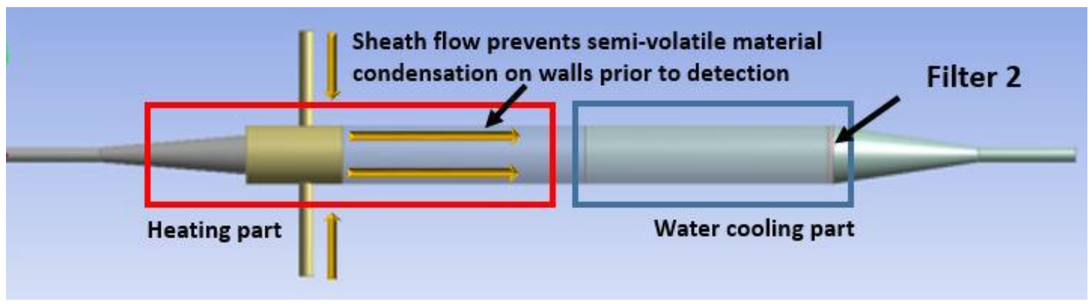

Fig. 2: Structure of the model

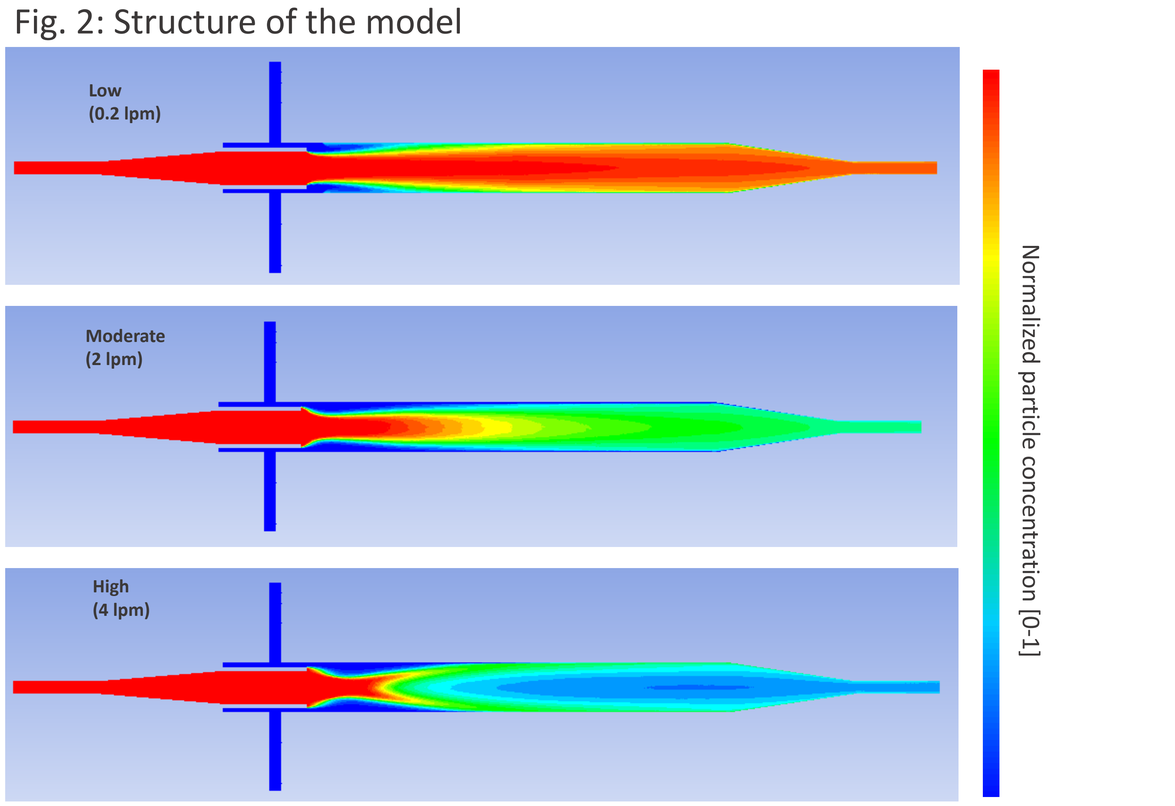

Fig. 3 - Transport and loss of particles with normalized concentration [0-1] in detector when using sheath flow. Central flow is fixed to 1 lpm. Mass diffusivity of 10^{-10} m^2/s comparable to 10 um droplets.

Experimental Set-up & Results

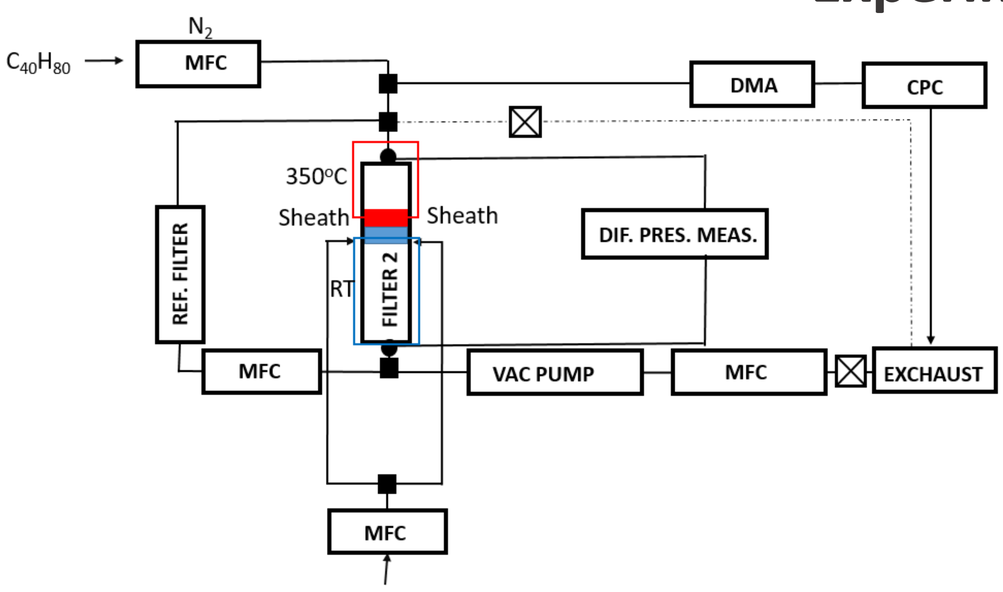

Fig. 4 - Schematic diagram of the first working prototype. Filter 2 is used for the collection of the semi-volatile material at the outlet. Reference filter before the inlet is used for comparison.

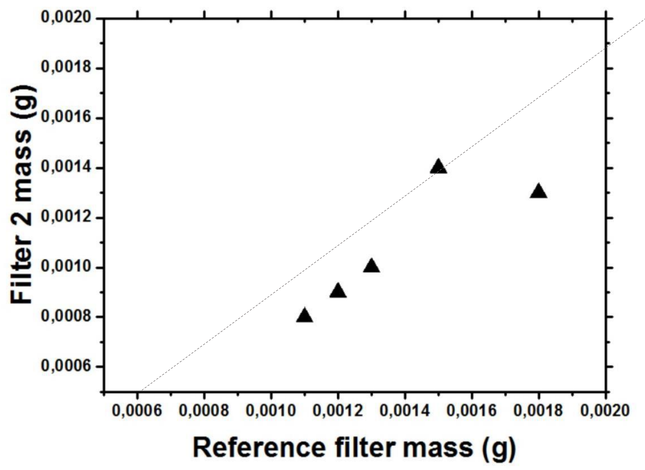

Fig. 5 - Collected semi-volatile mass on reference filter and Filter 2. For the same flow and amount of time mass on Filter 2 was close to the collected mass at the inlet.

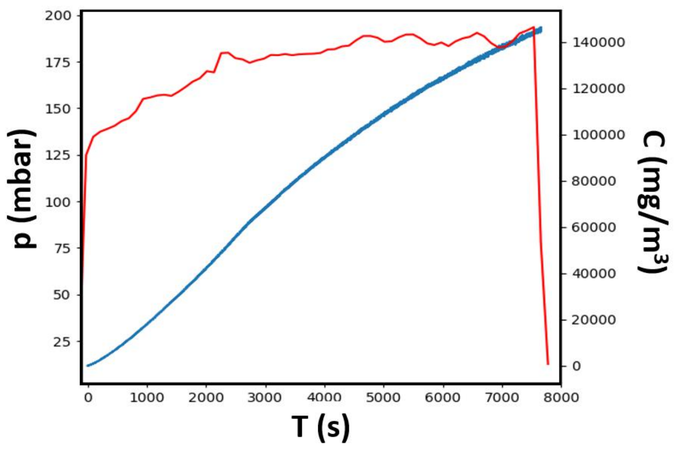

Fig. 6 - Pressure drop at filter 2 and concentration of the semi-volatile material versus time of the experiment.

Conclusions

- Development of the first working prototype of a device towards detecting semi-volatile particulate matter in a gas flow.
- Detected high fraction of the condensed semi-volatile particulate matter mass on the surface a cooled down filter downstream.

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