

Prereport for

CH-3896

**"Size and structures of nanoparticles and soot precursors generated in gas-phase reactive systems:
Structural dynamics sensing of small species through SAXS and WAXS"**

Experiment days: November 27 –December 04, 2013

Beamline: ID-12, Beamline manager Dr. Fabrice Wilhelm

**Experimenters: Frederik Ossler, Linda Vallenhag, Division of Combustion Physics, Lund University,
Sweden**

The experimental set-up including burner and detectors were brought from Lund and installed at the beamline ID-12 for the experiments. The set-up was very similar to the one used in the previous campaign CH-3405 in 2011. On this occasion the small-angle X-ray detector was upgraded with a rotation stage so that an increasing number of scattering angles could be investigated in order to increase the q-range of the measurements.

The intensity of the X-ray beam using vertical polarization was increased yielding photons fluxes of 8.1×10^{11} and 7.3×10^{11} photons s^{-1} , at 7 and 8 keV, respectively. The beam size was 0.300×0.390 mm² (V×H).

Measurements were performed on different types of flames, including sooting ones. An increased number of scattering angles were investigated, including the intermediate scattering region between the small-angle and wide-angle X-ray scattering (SAXS and WAXS) regions. A new detector prototype part was tested for this scattering region, but has to be adjusted for the next measurements. Instead the WAXS detector was scanned/rotated to lower scattering angles with respect to previous measurements. With respect to previous measurements the resulting signal-to-noise ratio was also improved considerably. The results for the WAXS are shown in **Figure 1**, where we have the ratio of scattering between that of a low-sooting flame condition and that of air for our two measurement campaigns CH-3405 and CH3896.

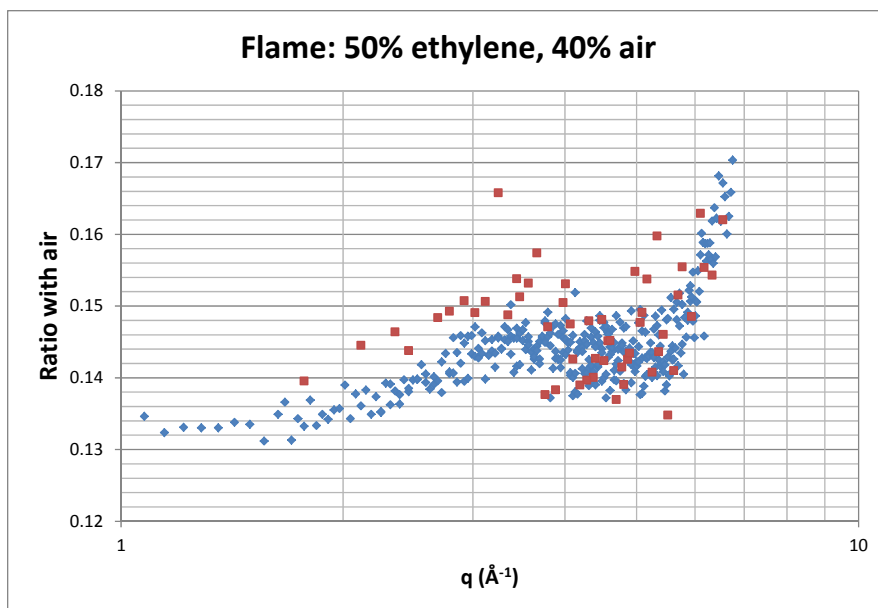


Fig.1: The blue symbols represent measured scattering intensities from a flame that is weakly sooting using the combined SAXS and WAXS detection system during the campaign CH-3896. The brown symbols are from our previous campaign CH-3405.

Concluding this pre-report we want to stress the very positive outcome of the campaign: The second sets of experiments were successfully made for vertically polarized radiation on flames. The photon flux was increased considerably and the general performance of the beamline and the technical support was excellent. The results are very encouraging for a continuation and developments of flame-based experiments at the beamline ID-12.

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Frederik Ossler, PhD, Assoc. Prof.