In situ measurements of soot formation in simple flames using small angle x-ray scattering

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Direct SAXS measurements of soot formation from ethylene have been made using laminar pre-mixed flames for the first time [1]. The slot burner was configured to maximise the signal from particulates. The geometry also enabled the thermal background from the surrounding hot gasses to be accurately removed. With cold flame speeds of 40 cm s^{-1} we have been able to identify particle sizes and densities from moderately sooty to rich flame conditions. By adjusting the height of the burner in the beam, the development of particles as a function of position above the flame tip and therefore as a function of time from ignition have been obtained. These reveal evidence for bimodal particle nucleation and growth at different stages in the continuous combustion of ethylene as shown below.

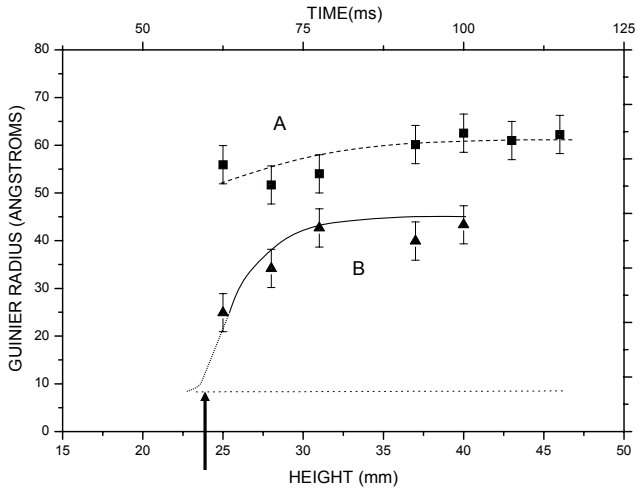

Figure Bimodal soot particles determined with *in situ* SAXS on the DUBBLE beamline.

[1] Gardner C, Greaves GN, Hargrave GK, Jarvis S, Wildman P, Meneau F. Bras W and Thomas G, *Nucl. Instrum. Meth. B* in press 2005