Impact of relative humidity on the yield and physical state of α-pinene SOA

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There are a number of studies that have measured the effect of varying humidity on the formation of aerosol particles from the ozonolysis of α-pinene (see *e.g.* Jonsson *et al*, 2006). However, these have yet to reach a well-supported conclusion on which the data agree. This study aimed to provide further information on the impact of relative humidity on SOA formation through laboratory-based measurements.

Measurements were conducted in the University of Reading atmospheric chemistry laboratory, employing a Scanning Mobility Particle Sizer (SMPS) to produce particle size distributions for the SOA produced at 0%, 30% and 80% RH. An Electrical Low Pressure Impactor (ELPI+) was also utilised to provide information on the physical state of the SOA produced. Previous work (Virtanen *et al*, 2010) has focused on the physical state of aerosol produced at 0% RH, but has not fully explored the range of RH conditions.

Little difference was noted between the mass yields and particle size distributions of SOA produced at 0% and 30% RH, and the slight differences observed lie within experimental error. However, further increasing to 80% RH showed a marked increase in mass yield and an upward shift in the particle size distribution. No change was observed in particle number concentration.

Figure 1 shows the particle size distributions obtained at 0%, 30% and 80% RH, for reactant concentrations of [α-pinene] = 2.00 ppm and $[O_3]$ = 1.00 ppm.

Use of the ELPI+ instrument allowed insight into the physical state of these aerosols. Bounce factors were calculated under each RH condition, and compared to those in the literature. The calculated bounce factors are summarised in Table 1.

Table 1. Calculated bounce factors for SOA produced under varying RH conditions.

Relative Humidity (%)	Bounce Factor
0	0.21 ± 0.04
30	0.15 ± 0.03
80	0.10 ± 0.02

The aerosol produced here was determined to be crystalline solid in nature, across all RH conditions. This may inhibit chemical transport across the particle, thus potentially reducing its reactivity within the atmosphere, and increasing the particle's lifetime.

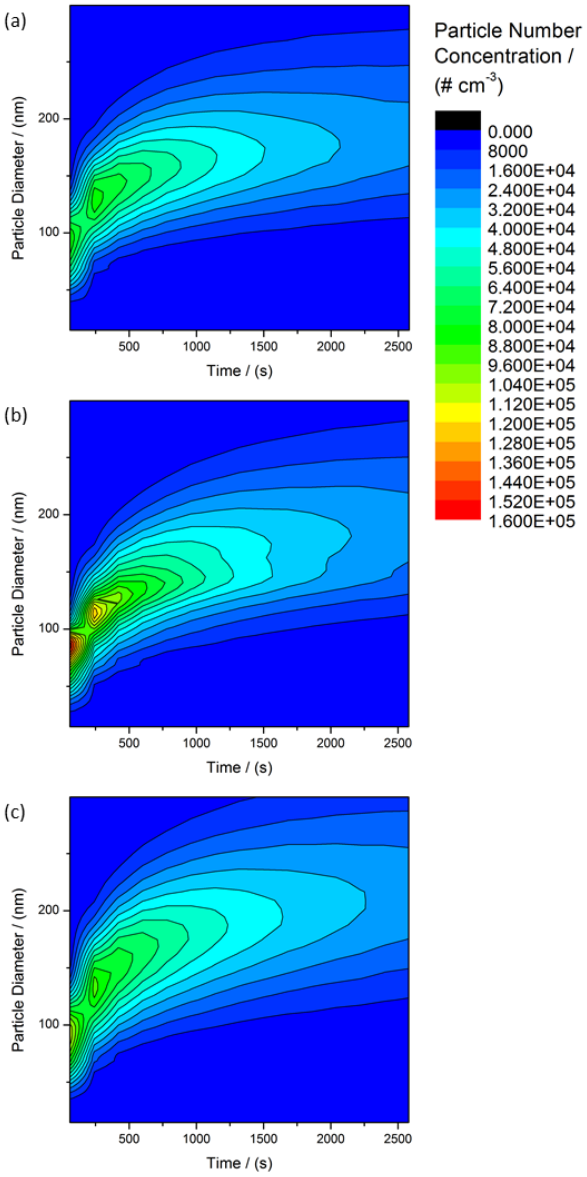

Figure 1. Size distributions of SOA produced at (a): 0%, (b): 30% and (c): 80% RH from the α-pinene ozonolysis.

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