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Aerosol growth from a mixture of toluene, 1,3,5-trimethylbenzene, octane and o-xylene for different humidity conditions

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The improvement of air quality represents an important challenge for our society. The presence in the air of some chemical compounds can produce a deterioration of the optimal conditions for life. European legislation regulates air levels for some gas and particulate phase species in order to avoid potential damage to human health or ecosystems. Besides their effect on human health, particles also contribute to the radiative balance by dispersing and/or absorbing light for certain wavelengths, depending on their physical and chemical properties, such as size, composition and concentration. The group of the organic particles that are formed in the atmosphere is known as secondary organic aerosols (SOA).
The oxidation of organic gases leads to the production of low-volatility compounds than can partition into the aerosol phase. Nevertheless, the complete picture of SOA formation is not yet completely understood. A rigorous knowledge of how they are formed in the atmosphere and how their formation and growth is affected by the environmental conditions is essential to provide air quality models with the science required to simulate the concentration of this air pollutant. Chambers have been extensively used for research purposes, in order to isolate a specific or a simple set of physical and/or chemical processes under ideal and controlled conditions. In this poster we show the results obtained from some experiments performed in an outdoor chamber (EUPHORE, Valencia, Spain) to investigate how humidity affects the organic aerosol growth. In those experiments a mixture of VOCs (toluene, 1,3,5-trimethylbenzene, o-xylene and octane) and HONO (as the oxidant agent) were introduced for different humidity conditions (0, 20, 35 and 50% of relative humidity). A SMPS (scanning mobility particle sizer) was used to determine both aerosol concentration and size distribution.
Regarding aerosol concentration, a similar pattern was found for 0, 20 and 35% relative humidity. This common pattern was characterized by a quick aerosol formation at the opening of the chamber, followed by a smother one. Nevertheless the experiment at 50% of relative humidity showed a different behaviour: the initial aerosol formation was significant smoother than in the other conditions. Four hours after the opening of the chamber SMPS aerosol concentration for this experiment was around 20 [U+F06D]g/m3, that is, the half of the one measured in the other experiments. Regarding aerosol size, the highest-concentration size distribution for each experiment was centred on the following mean diameters: 53 nm at dry conditions, 51 nm at 20% of relative humidity and 73.7 and 79.1 nm at 35 and 50% relative humidity, respectively. These results indicate that coarser aerosols are found for 50% of relative humidity at the beginning of the experiment, although differences at 20, 35 and 50% are smaller at the end of it. Dry conditions seem to lead to the smallest aerosol size at the end of the experiment.

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