

SOA FORMATION IN A PHOTORREACTOR FROM A MIXTURE OF HYDROCARBONS AND NOX

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Abstract

Some research is presently focused on secondary organic aerosols (SOA). The representation of SOA formation has been more recently incorporated in air quality models. The inclusion of PM_{2.5} in the European legislation related to air quality has increased the interest of modelling SOA, as it is a fraction of PM_{2.5}. Monitoring methodologies are able to measure the presence of organic aerosols in the real atmosphere, but the primary or secondary origin of these organic aerosols can not be experimentally determined. To quantify the formation of SOA, ten experiments were carried out in an outdoor chamber (EUPHORE, Valencia, SPAIN) in 2008, between June, 16 and July, 4. A mixture of hydrocarbon and NO_x was emitted into the photoreactor. As no aerosol was emitted, all the registered aerosols were formed inside the photoreactor. A further analysis was done to characterize the inorganic and organic composition of the secondary organic aerosols resulting from the emissions of the emitted gases in the reactor.

Description of the experiments

A mixture of some hydrocarbon with high potential to form SOA was introduced in the photoreactor. In 9 of the experiments, four antropogenic hydrocarbons were emitted: toluene, o-xylene, octane and tri-methyl-benzene. In the last experiment, biogenic hydrocarbons (isoprene, a-pinene and limonene) were emitted.

Nitrogen oxides were also introduced in the reactor. One of the objectives of the experiments was to analyse the influence of NO_x/COV relation in SOA formation. Concentrations for the mixture of hydrocarbon and NO_x are presented in Table 1. Also the influence of relative humidity on SOA formation was analysed. Finally, the impact of inorganic particles was evaluated by emitting SO₂ in the chamber (EXP 9 and 10)

Some of the automatic measurements were registered every minute. For other pollutants, measurements were taken every 5 minutes, 10 minutes. Some samples were also taken to determine phenol and aldehydes contents. Samples of aerosols were taken in order to study the organic composition.

Table 1 Concentrations of the different compounds for every experiment.

	DATE	TOL (ug/m3)	O-XIL (ug/m3)	TMB (ug/m3)	OCT (ug/m3)	NO2 (ug/m3)	SO2 (ug/m3)	HR (%)
EXP1	16/06/2008	200	40	400	200	60		0
EXP2	17/06/2008	400	80	800	400	120		20
EXP3	18/06/2008	800	160	1600	800	120		20
EXP4	19/06/2008	200	40	400	200	120		20
EXP5	20/06/2008	400	80	800	400	240		20
EXP6	23/06/2008	400	80	800	400	60		20
EXP7	24/06/2008	400	80	800	400	120		0
EXP9	26/06/2008	400	80	800	400	120	~1000	20
EXP10	01/07/2008	400	80	800	400	120	60	20
		<i>a-PIN</i> (ug/m3)	<i>ISO</i> (ug/m3)	<i>LIMO</i> (ug/m3)				
EXP8	25/06/2008	136.24	68.15	136.24		200		20