Secondary Organic Aerosol formation in the atmosphere by new aerosol-based photo-induced processes

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The formation mechanisms of secondary organic aerosols (SOA) currently considered for in the atmosphere, mostly taking into account the gas precursor volatility, underestimate atmospheric SOA masses. Reactivity inside the aerosol particles could, in principle, account for the missing masses but the exact processes remained to be identified until now.
Here we report new aerosol-based photo-induced processes producing SOA at atmospheric growth rates from a range of gas precursors (isoprene, limonene, butanol, toluene…). Unlike in the current mechanisms the precursors are oxidized in the aerosol particles, not tin he gas phase, by radicals produced by the excitation of a photosentisizer present in the aerosol phase by sunlight. The resulting SOA yields are thus strongly enhanced by the reactive uptake and by the contribution of a wide range of precursors. Such photosentisizers were also identified among the multiphase reaction products of common atmospheric gases, increasing the importance of these processes in the atmosphere.