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Interaction between gas phase ozone and phenols in presence of photosensitizers

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In term of multiphase tropospheric chemistry, it has been accepted that aerosols play an important role as possible sites for chemical reactions (heterogeneous chemistry). When the term heterogeneous chemistry is addressed in atmospheric research, it usually includes processes which are in fact heterogeneous (e.g. interactions of gas phase molecules with surfaces of liquids or solids).

The aromatic compounds are particularly interesting among the other organics due to their physical and chemical properties. The sources of atmospheric phenols in one hand include the combustion of wood, coal and other biomass processes and on the other hand they can be formed directly in the atmosphere by the OH-initiated atmospheric oxidation of aromatic hydrocarbons.

The aim of this study was to investigate the effect of light $>$ 300nm on various surfaces taken as proxies for organic surfaces in the troposphere. For this purpose the organic solid films have been prepared as a mixture of 4-benzoyl benzoic acid (4-BBA) and the corresponding phenol on the quartz glass which, later on, was placed in a chamber and exposed to the light ($>$ 300nm) and the ozone with concentration of $\approx 10^{15}$ [molecule cm^{-3}]. The light around 330 nm is primarily absorbed by 4-BBA and therefore it can be expected to act as a photosensitizer for the decrease of ozone. In fact the photoexcitation of 4-BBA produces the excited triplet states that can act as one electron oxidant.

The measurements undertaken in this study relied on direct observations of contact angles between organic films (e.g. 4- benzoyl benzoic acid and phenol) and water as indicators of wettability. The contact angle is a measure of the competing tendencies of the liquid drop and solid determining whether it spreads over the solid surface or rounds up to minimize its own area. The wetability on the surface was probed before and after exposure of ozone and light and it was realized that the surface becomes more hydrophobic as a consequence of the formed surface bound products and indicates that possible oligomer formation might occurs.

Understanding the interactions between atmospheric organic surfaces and water is significant in order to identify their role in affecting cloud properties, their optical properties and their heterogeneous atmospheric processes.