Phototransformation process of mixed single inorganic/organic particles. An AFM, Raman and FTIR study

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The importance of characterizing composition and microstructure of aerosol particles is now well-established for inferring key properties of the aerosol such as hygroscopicity, the activity of cloud condensation, the reactivity, the optical properties, etc. Aerosol particles consist of complex mixture of inorganic salts with hydrophilic and/or hygrophobic organic components which may evolved during their transportation into the atmosphere when they are exposed to gaseous traces and/or solar irradation. The properties of atmopsheric aerosols can be resolved at varying level of details including single particle level. Indeed, the physical state of a particle and its composition and heterogeneity can be resolved with a degree of spatial resolution by single particle analytical methodology [1-3]. In this work we have investigated chemical and microstructure evolution of unique particles composed of inorganic salts (NaCl) and organic species (long-chain carboxyl acid) when they are subject to UV/Vis light simulating the atmopsheric particle aging. The chemical composition and the surface tension of the particles were estimated using Atomic Force Microscopy (AFM) [Fig.1], Raman microspectrometry (RMS) and FTIR spectroscopy, performed on the same individual particles. The measurements were carried out for various irradiation times. Photodegradation of organic compounds distributed over the particle surface were correlated with the surface tension changes (σ). Complementary experiments using acoustic levitation device coupled with vibrational spectrocopy were achieved.

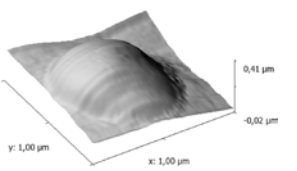

Figure 1: AFM image of mixed NaCl/organic droplet

[1] Krieger *et al*. (2012) *Chem. Soc. Rev*. **41**, 6631-6662. [2] Mikhailov *et al*. (2009) ACP **9**, 9491-9522. [3] Morris *et al*. (2015) *Chem. Sci*. **6**, 3242-3247.