

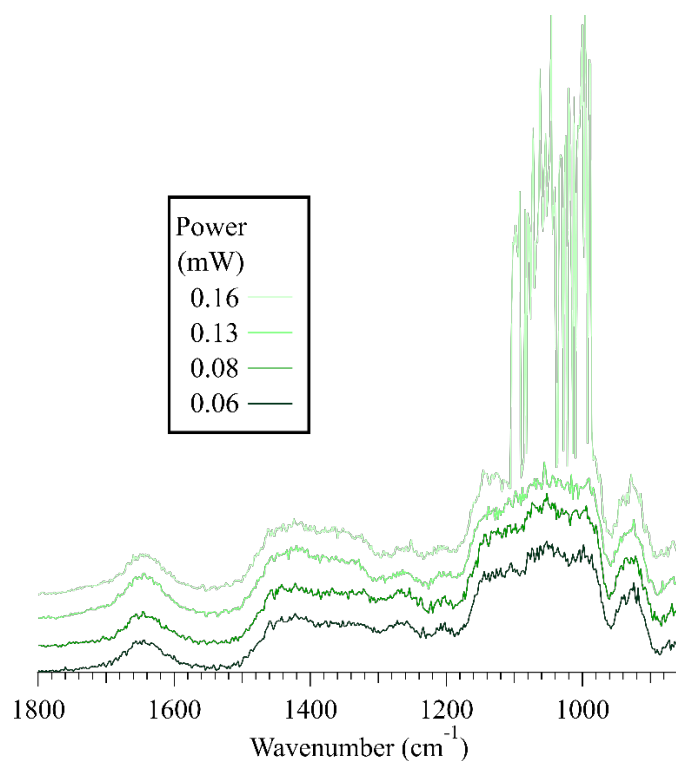
### Electronic Supplementary Information (ESI)

#### Lab on a Tip: Atomic Force Microscopy – Photothermal Infrared Spectroscopy of Atmospherically Relevant Organic/Inorganic Aerosol Particles in the Nanometer to Micrometer Size Range

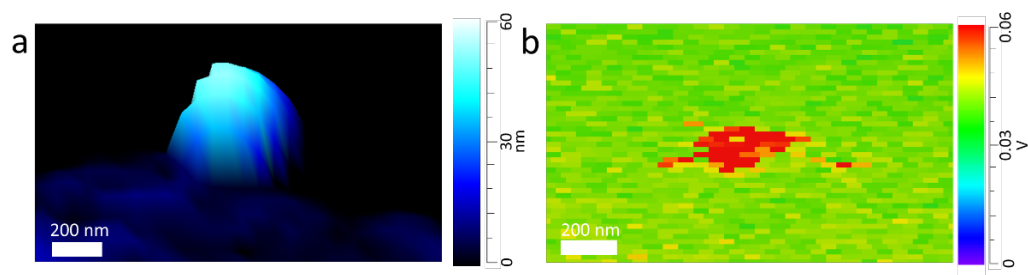
Victor W. Or<sup>a</sup>, Armando D. Estilloré<sup>a</sup>, Alexei V. Tivanski<sup>c\*</sup>, and Vicki H. Grassian<sup>ab\*</sup>

- <sup>a</sup> Department of Chemistry and Biochemistry, University of California San Diego, La Jolla, CA 92093, USA. Email: [vhgrassian@ucsd.edu](mailto:vhgrassian@ucsd.edu); Tel: (858)-534-2499
- <sup>b</sup> Scripps Institution of Oceanography and Department of Nanoengineering, University of California, San Diego, La Jolla, CA 92093, USA.
- <sup>c</sup> Department of Chemistry, University of Iowa, Iowa City, Iowa 52242, USA  
Email: [alexei-tivanski@uiowa.edu](mailto:alexei-tivanski@uiowa.edu); Tel: (319)-384-1865

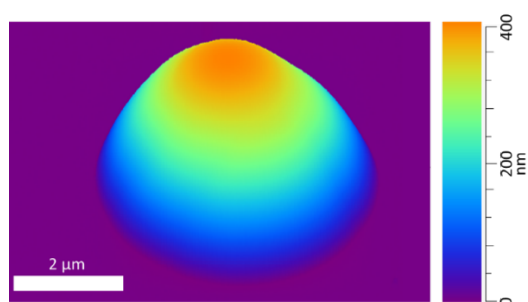
Additional images are provided in the ESI material.



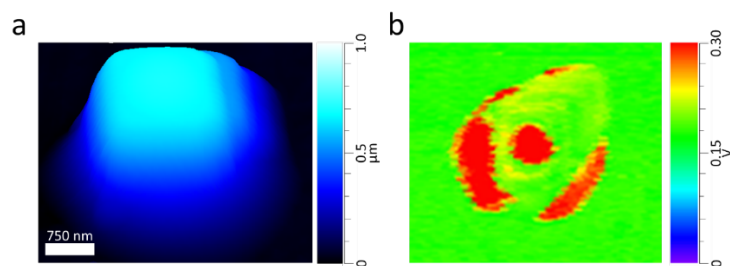
**Supplemental Figure 1** PTIR spectra taken on a sucrose particle with increasing laser power from 0.06 to 0.16 mW. Particle damage is spectrally apparent at 0.16 mW, as seen by the growth of irregular shaped peaks between 980 to 1100 cm<sup>-1</sup>.



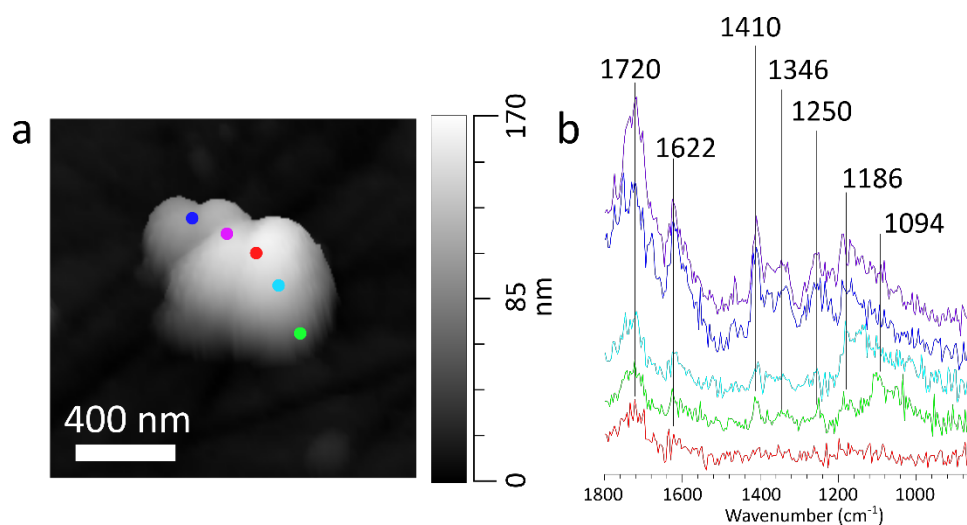
**Supplemental Figure 2** a) 3D height image of an ammonium sulfate particle on a ZnS substrate with a volume equivalent diameter of 110 nm. b) Chemical map of the ammonium sulfate particle taken at  $1120\text{ cm}^{-1}$ .



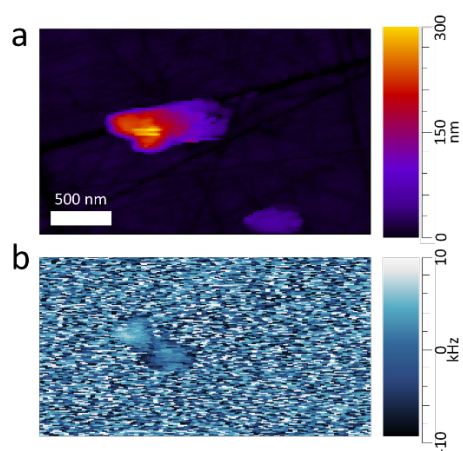
**Supplemental Figure 3** 3D height image of a methyl glyoxal particle on a ZnS substrate with a volume equivalent diameter of  $1.3\text{ }\mu\text{m}$ , imaged in contact mode.



**Supplemental Figure 4** a) 3D height image of a particle of sodium chloride and glucose with a volume equivalent diameter of  $1.3\text{ }\mu\text{m}$  on a ZnS substrate. b) Chemical map of the sucrose rich regions of the particle taken at  $3230\text{ cm}^{-1}$  in a core-shell phase separated morphology.



**Supplemental Figure 5** a) 3D height image of a particle of sodium chloride and pimelic acid with a volume equivalent diameter of 280 nm on a ZnS substrate. b) PTIR spectra taken across the particle at the corresponding color marked locations.



**Supplemental Figure 6** a) Height image of the ammonium sulfate coated pimelic acid particle from Fig 6 b) Frequency map of the particle at  $1698\text{ cm}^{-1}$ . The region of the particle rich in ammonium sulfate and poor in pimelic acid, has no active modes near  $1698\text{ cm}^{-1}$  and appears as noise.