Supplemental material to:

Kinetic Study of Heterogeneous Reaction of Deliquesced NaCl Particles with Gaseous HNO_3 Using Particle-on-Substrate Stagnation Flow Reactor Approach

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Journal of Physical Chemistry A, 2007

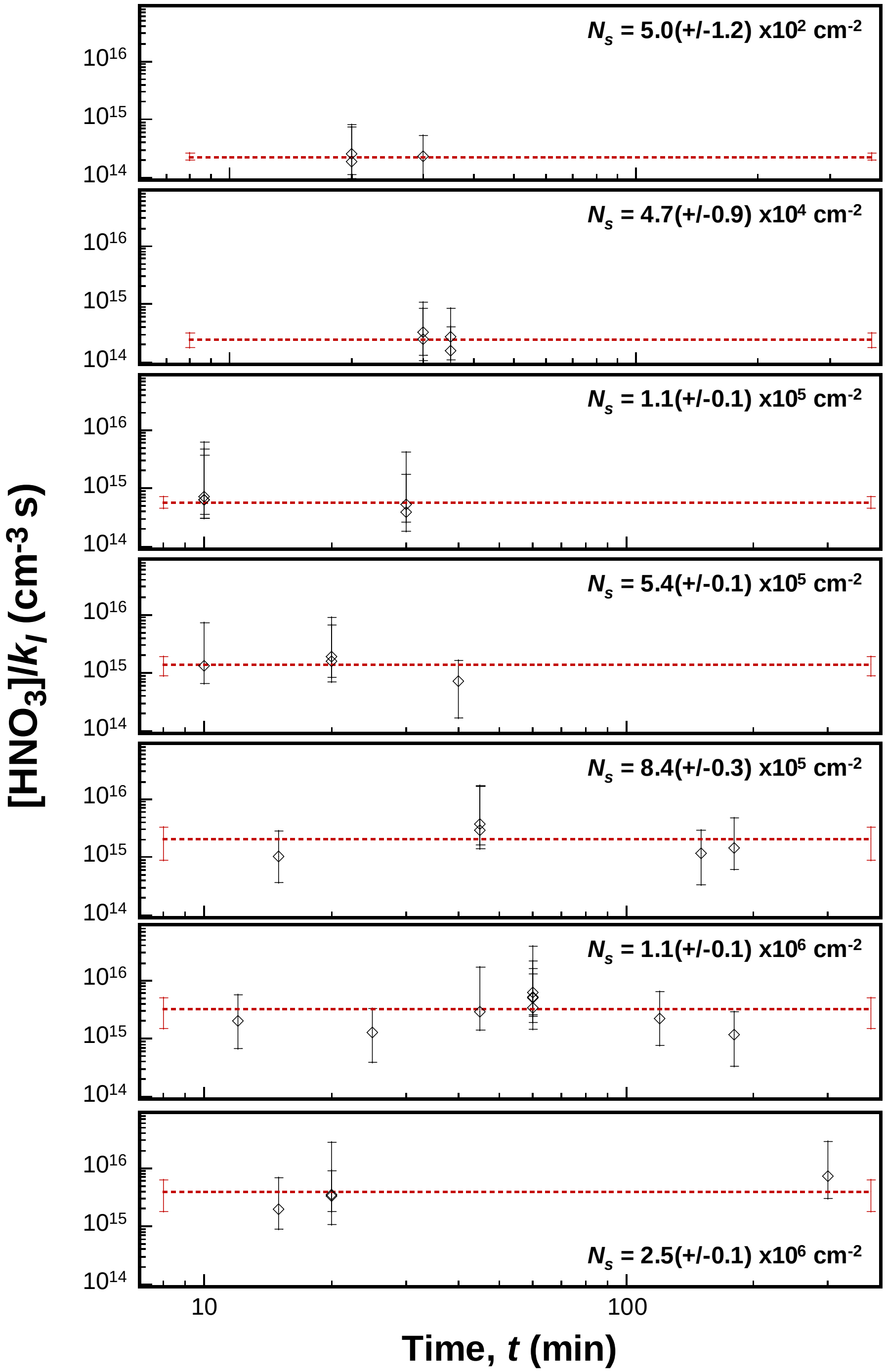

Figure S1. Variations of $[HNO_3]/k_I$ as a function of reaction time. Each panel represents measurements selected from series A1, A2, A3 and B1 at a fixed surface number density N_s value. The error bar on each datum point represents one standard deviation. The dashed line indicates the average of the measured data; the error bars at the left- and rightmost of the line indicating one standard deviation of the $[HNO_3]/k_I$ data. As seen, there is no discernible, systematic variation of $[HNO_3]/k_I$ as a function of reaction time over the entire range of surface number density employed in the current study.

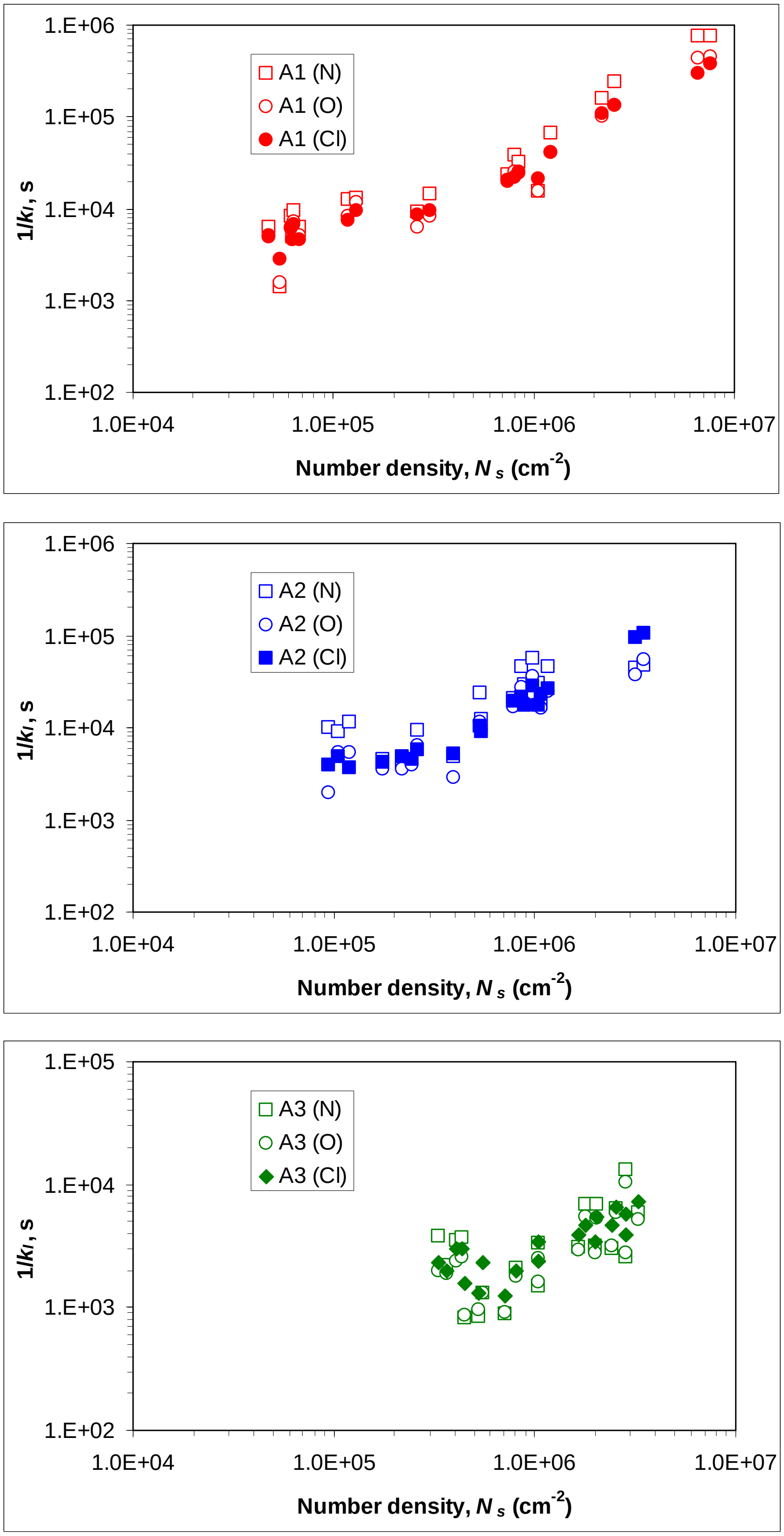

Figure S2. Values of $1/k_I$ as a function of particle number density on the substrate surface (N_s), determined experimentally from Cl depletion (solid symbols), and N (open squares) and O (open circles) enhancements for the three series of experiments (see, Table 2).

The first-order rate constant k_I may be determined from Cl depletion,

$$k_I = -\frac{1}{t}\ln\left(\frac{[\mathrm{Cl}/\mathrm{Na}]_t^{\mathrm{EDX}}}{[\mathrm{Cl}/\mathrm{Na}]_{t=0}^{\mathrm{EDX}}}\right). \tag{s1}$$

Alternatively, the rate constant may be determined also from O or N enhancement, which are given respectively by

$$k_I = -\frac{1}{t}\ln\left(\frac{[\mathrm{O}/\mathrm{Na}]_{NaNO_3}^{\mathrm{EDX}} - [\mathrm{O}/\mathrm{Na}]_t^{\mathrm{EDX}}}{[\mathrm{O}/\mathrm{Na}]_{NaNO_3}^{\mathrm{EDX}} - [\mathrm{O}/\mathrm{Na}]_{t=0}^{\mathrm{EDX}}}\right) \tag{s2}$$

and

$$k_I = -\frac{1}{t}\ln\left(\frac{[\mathrm{N}/\mathrm{Na}]_{NaNO_3}^{\mathrm{EDX}} - [\mathrm{N}/\mathrm{Na}]_t^{\mathrm{EDX}}}{[\mathrm{N}/\mathrm{Na}]_{NaNO_3}^{\mathrm{EDX}} - [\mathrm{N}/\mathrm{Na}]_{t=0}^{\mathrm{EDX}}}\right) \tag{s3}$$

Because of background noise of O and N signals even in pure NaCl samples, two references, $[\mathrm{O\ or\ N/Na}]_{t=0}^{\mathrm{EDX}}$ and $[\mathrm{O\ or\ N/Na}]_{NaNO_3}^{\mathrm{EDX}}$, corresponding to 0% and 100% conversions respectively, are used in equations (s2) and (s3).