

is the predominant route for gas-phase nitric acid formation under typical daytime conditions. Nitric acid vapor, once formed, may then react with NH_3 , a ubiquitous atmospheric constituent with both natural and anthropogenic sources, to produce ammonium nitrate, NH_4NO_3 (path 2), which at standard temperature and pressure, exists as a solid. Alternatively, the nitric acid vapor may be absorbed directly onto a particle (path 3), although thermodynamic and kinetic considerations favor reaction with NH_3 to form NH_4NO_3 as the path of conversion of gaseous nitric acid to nitrate in particulate form.⁴⁸⁻⁵⁰ Path 4 involves the direct absorption of NO and NO_2 into an atmospheric particle, a route that is likely for certain aqueous particles, particularly when accompanied by the absorption of ammonia (path 5).⁵¹ Path 6 depicts the formation of organic nitrates through reactions such as 6-38a, followed by absorption of these nitrates into particles. At present little is known about the existence or importance of mechanisms such as that depicted by path 6.

There have been a limited number of measurements of nitric acid and particulate nitrate concentrations in ambient air, and of these measurements many have identified the particulate nitrate as NH_4NO_3 , suggesting that the aerosol may consist of solid NH_4NO_3 or NH_4^+ and NO_3^- in solution in approximate stoichiometric balance. It is difficult to estimate the relative importance of the paths in Figure 6-1 for several reasons. First, the rate of reaction of nitric acid and ammonia is