however, to account for the high conversion rates of nitric oxide to nitrogen dioxide observed in the atmosphere under typical ambient concentrations.

Since sunlight triggers the phenomenon of photochemical smog formulation, it is important to recognize those constituents that will absorb light energy. In some cases, these constituents decompose or become activated for reaction. Nitrogen dioxide, a dominant sunlight absorber in the urban atmosphere, photodissociates upon absorbing wavelengths of light <430 nm. This photolytic reaction results in the formation of the ground state, triple-P oxygen atom, and a nitric oxide molecule. The efficiency of this process is wavelength-dependent:

$$NO_2 + \text{sunlight (290-430 nm)} \longrightarrow O(^3P) + NO. \quad (21)$$

The highly reactive triplet-P oxygen atom predominantly reacts with oxygen molecules in the air, resulting in the formation of ozone.

$$O(^3P) + O_2 + M \longrightarrow O_3 + M. \quad (22)$$

In this equation M represents a nitrogen, oxygen, or other third molecule that absorbs the excess vibrational energy released, thereby stabilizing the ozone produced. For many conditions common in polluted atmospheres when NO is present at high concentrations, ozone molecules regenerate nitrogen dioxide by reaction with nitric oxide:

$$O_3 + NO \longrightarrow NO_2 + O_2. \quad (23)$$

To a much lesser extent, ozone can react with nitrogen dioxide to form the transient species, nitrogen trioxide:

$$O_3 + NO_2 \longrightarrow NO_3 + O_2. \quad (24)$$

The nitrogen trioxide can further react with nitrogen dioxide to form dinitrogen pentoxide, the reactive anhydride of nitric acid,

$$NO_3 + NO_2 \longrightarrow N_2O_5 \quad (25)$$