photodissociates upon absorbing wavelengths of light <430 nm. This photolytic reaction results in the formation of the ground state, triplet-P oxygen atom, and a nitric oxide molecule. The efficiency of this process is wavelength-dependent:

$$NO_2 + \text{sunlight (290-430 nm)} \rightarrow O(^3P) + NO \quad (6\text{-}2)$$

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

$$O(^3P) + O_2 + M \rightarrow O_3 + M \quad (6\text{-}3)$$

M in this equation represents a nitrogen, oxygen, or other third molecule that absorbs the excess vibrational energy released, thereby stabilizing the ozone produced. For most concentration conditions common in polluted atmospheres, ozone molecules regenerate nitrogen dioxide by reaction with nitric oxide:

$$O_3 + NO \rightarrow NO_2 + O_2 \quad (6\text{-}4)$$

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

$$O_3 + NO_2 \rightarrow NO_3 + O_2 \quad (6\text{-}5)$$

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

$$NO_3 + NO_2 \rightarrow N_2O_5 \quad (6\text{-}6)$$

Dinitrogen pentoxide which is in equilibrium with