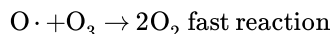
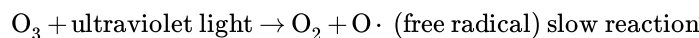


12.12: Reaction Intermediate

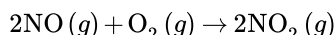
Ozone (O_3) depletion in the atmosphere is of significant concern. This gas serves as a protection against the ultraviolet rays of the sun. Ozone is naturally depleted in addition to the depletion caused by human-made chemicals. The depletion reaction is a two-step process:



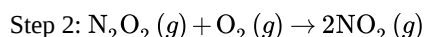
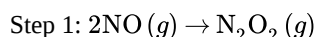
The free radical is not a part of the overall equation, but can be detected in the lab.

Intermediate

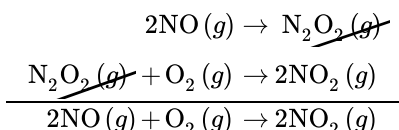
Reaction mechanisms describe how the material in a chemical reaction gets from the initial reactants to the final products. One reaction that illustrates a reaction mechanism is the reaction between nitrogen monoxide and oxygen to form nitrogen dioxide:



It may seem as though this reaction would occur as the result of a collision between two NO molecules with one O_2 molecule. However, careful analysis of the reaction has detected the presence of N_2O_2 during the reaction. A proposed mechanism for the reaction consists of two elementary steps:



In the first step, two molecules of NO collide to form a molecule of N_2O_2 . In the second step, that molecule of N_2O_2 collides with a molecule of O_2 to produce two molecules of NO_2 . The overall chemical reaction is the sum of the two elementary steps:



The N_2O_2 molecule is not part of the overall reaction. It was produced in the first elementary step, then reacts in the second elementary step. An **intermediate** is a species which appears in the mechanism of a reaction, but not in the overall balanced equation. An intermediate is always formed in an early step in the mechanism and consumed in a later step.



Figure 12.12.1: Nitrogen dioxide (left) and dinitrogen tetroxide (right). (CC BY-NC; CK-12)

Summary

- Reaction mechanisms describe how the material in a chemical reaction gets from the initial reactants to the final products.
- An intermediate is a species which appears in the mechanism of a reaction, but not in the overall balanced equation.

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