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# Acid Rain

## Reducing Its Harmful Effects

This is a research paper on acid rain, how it is caused, and what environmental regulations can be put out to stop the harmful effects of acid rain. This also includes some safety regulations we can put out when acid rain is being produced.

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# What is Acid Rain?

Acid rain is known as precipitation in an acidic form. It can be extremely harmful to the environment, and more importantly to us. Acid Rain can be caused by emissions of acidic chemicals or chemicals such as sulfur dioxide, or nitrogen oxide, as well as hydraulic acid. Acid Rain is used to describe emission of both wet and dry acidic components included in rain.

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## Nitric Acid as an example:

1. Nitric Acid is one of the most commonly used examples of acid rain.
    - a. It can be produced by electric discharges in the atmosphere.
      - i. The most common electric discharge in the atmosphere is lightning.
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## Acid Rain through Carbonic Acid

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1. Even though carbonic acid is a weak acid it can still be considered harmful to many crops we eat today. This can lead to major problems or shortages in our food supply because of carbonic acid in acidic rain.
  2. Carbonic Acid is an organic compound
  3. Carbonic Acid is used to create Carbonated water
  4. When Carbon Dioxide is produced in water, it creates Carbonic Acid.
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## Emissions of Chemicals Leading to Acidic Rain

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1. Sulfur Dioxide is the most important (most common) gas leading to acidification of water. Sulfur Dioxide also isn't odorous when it produces acid, so you will know if it emits.
  2. Fossil Fuel can also cause acidic rain when nonrenewable and greenhouse gases are released in the environment.
  3. Electric power utilizing coal can lead to a major implication of Acidic Rain.
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## Avoiding Acid Rain

Avoiding Acid Rain is quite simple; the main step is energy conservation. Energy conservation leads to less greenhouse gases being released into the environment. This is a very helpful step in avoiding acid rain.

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## Study of the Trioxide Layer

1. The trioxide layer is a three part molecule consisting of three atoms of oxygen.
  2. Trioxide is known to be the allotrope of oxygen. Ozone is then formed by Dioxide being exposed to energy from ultraviolet light.
  3. In total, the balance of the ozone layer makes .6 parts per million of the atmosphere. This makes the ozone layer an extremely powerful oxidant.
  4. Ozone is far stronger than O<sub>2</sub>.
  5. Ozone is a diamagnetic substance.
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Spectroscopic Reactions and Structure:



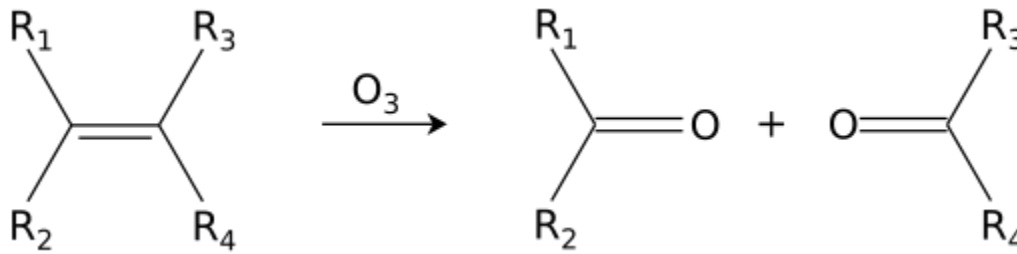
Oxidation with Nitric Oxide to Nitrogen Dioxide:



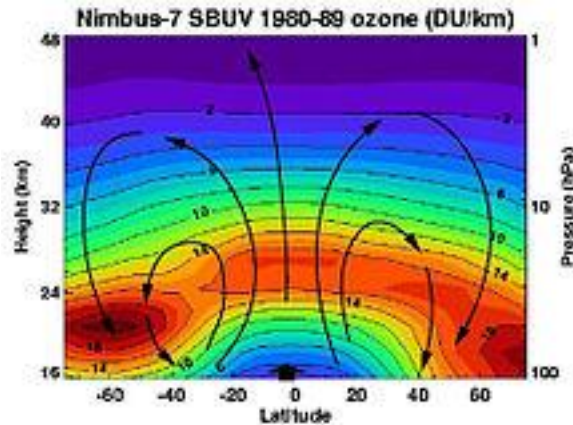
Further oxidized:



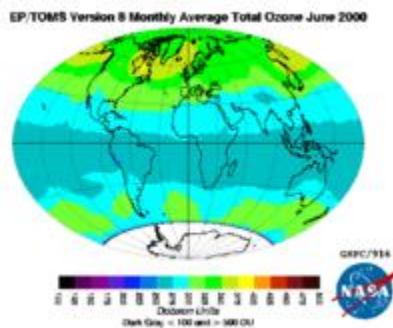
Ozone with Alkenes:



Satellite Image of Concentration of Ozone:



Ozone Concentration Measured by NASA



## Ozone Air Pollution:

Ozone can cause a negative effect on the tropospheric zone and cause pollution to our lungs and the environment.

1. This can be avoided by conservation
  - a. The Ozone Layer is known to irritate the respiratory system
  - b. Ozone can be caused by an unreasonable amount of fossil fuel burning, which can lead to acid rain
  - c. This can also cause discoloration of leaves (see bottom pic)



- d. The Clean air act directs the EPA to stop excessive use of ozone and fossil fuel burning, however sometimes it is not enough.
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## Resources:

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4. [^](#) US Environmental Protection Agency (2008). "[Clean Air Markets 2008 Highlights](#)". [http://images.google.com/imgres?imgurl=http://www.epa.gov/airmarkt/progress/ARP\\_4/NOx-Emission-Trends-for-All-Acid-Rain-Program-Units.gif&imgrefurl=http://www.epa.gov/airmarkt/progress/ARP\\_4.html&usq=qYQtwO9Hldtam9UIQp48Gy58lmU=&h=355&w=788&sz=18&hl=en&start=5&um=1&tbnid=4GNKn98e78ebJM:&tbnh=64&tbnw=143&prev=/images%3Fq%3Dacid%2BBrain%2B.gov%26hl%3Den%26um%3D1](http://images.google.com/imgres?imgurl=http://www.epa.gov/airmarkt/progress/ARP_4/NOx-Emission-Trends-for-All-Acid-Rain-Program-Units.gif&imgrefurl=http://www.epa.gov/airmarkt/progress/ARP_4.html&usq=qYQtwO9Hldtam9UIQp48Gy58lmU=&h=355&w=788&sz=18&hl=en&start=5&um=1&tbnid=4GNKn98e78ebJM:&tbnh=64&tbnw=143&prev=/images%3Fq%3Dacid%2BBrain%2B.gov%26hl%3Den%26um%3D1). Retrieved 2010-01-31.
5. [^](#) Clean Air Act Amendments of 1990, 42 *U.S. Code* 7651
6. [Morgan Sally: Acid Rain | ISBN: 9780749662141 \(074966214X\) | Naše ...](#)  
Acid Rain. 3 Rev Ed. Hachette Children's Books (United Kingdom), 2005 ... Acid Rain. Examines environmental problems and solutions in a child friendly way. ... [www.bookfayre.cz/books/item/9780749662141.html.cs](http://www.bookfayre.cz/books/item/9780749662141.html.cs)