CHEM 20204

Lecture 5 **January 31, 2012**

Ground Level Air Pollution - SMOG

Topics covered

- **Brief comparison of chemical processes in troposphere and stratosphere**
- **Primary and secondary pollutants in the troposphere**
- **Photochemical smog and ground level ozone**
- **Limiting VOC and NO emission**
- **Clean Air act**

Keypoints to remember:

Primary pollutants

NOx Oxides of nitrogen (NO and NO_2)
SOx Oxides of nitrogen (SO_2)
and VOCs Volatile organic carbon (hydrocarbons, ethene etc.)

Secondary pollutants

O_3, HNO_3, H_2SO_4, peroxyacetylnitrate (PAN)

Tailpipes and Smoke stacks are the sources of photochemical smog

Sunlight, NOx and VOCs contribute to the smog by undergoing a series of chemical reactions involving free radicals

VOCs + NO + O_2 + sunlight $\longrightarrow$ mixture of O_3, HNO_3, organics, free radicals

Ground level ozone:
Ground-level ozone is formed when vehicle/power plant exhaust and some other chemicals commonly used in industry mix are exposed to strong sunlight. When the ozone concentrations get high enough, they can make breathing difficult, especially for people with asthma and other respiratory diseases.

1970: Clean Air Act
To regulate the emission of **six pollutants**:
SOx, NOx, VOC, Pb, O_3, and Particulate matter

What control strategies were adopted for tailpipe and smoke stack emissions?

Did you know?
-The smog in the U.S. cities decreased upon introduction of catalytic converters in cars
- Ozone action days are called when the AQI is forecast to be Unhealthy for Sensitive Groups
-Plan to build 18 coal fired power plants was abandoned three years ago in Texas because of public resentment (NIMBY –Not In My Backyard!!)
-All new cars in California now carry smog and global warming scores