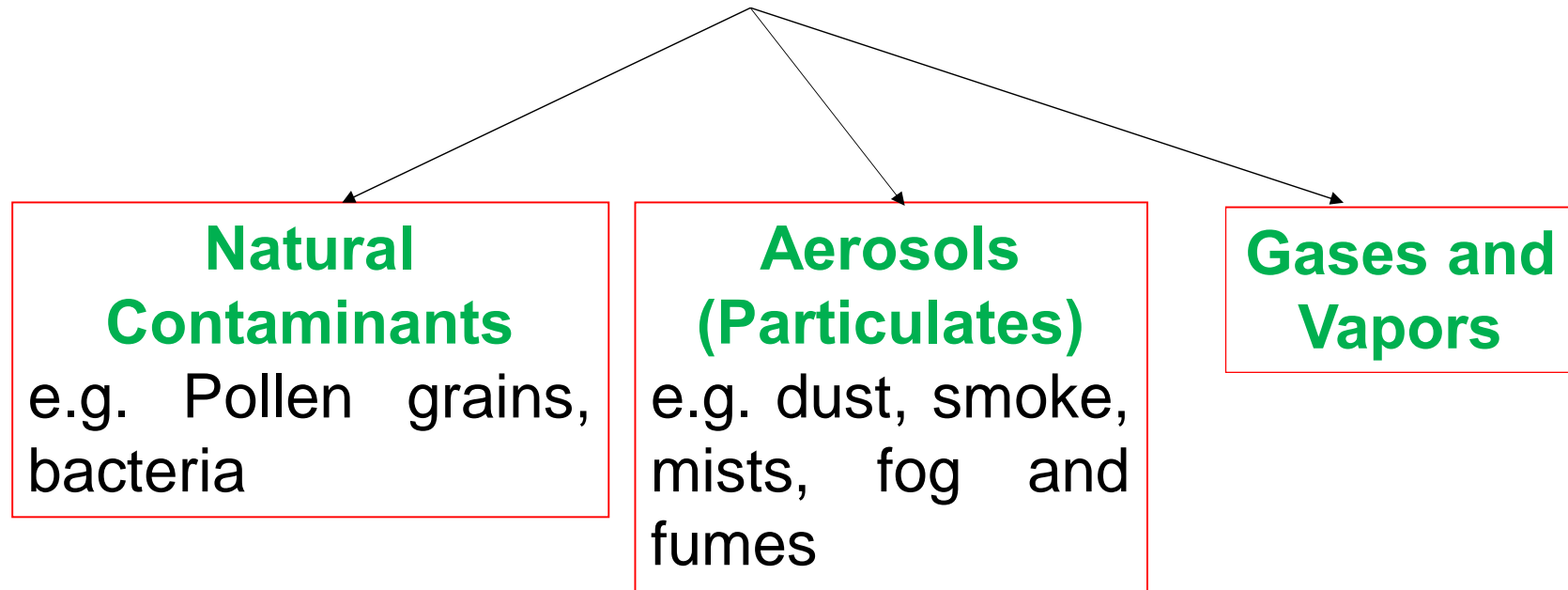


Lecture 6

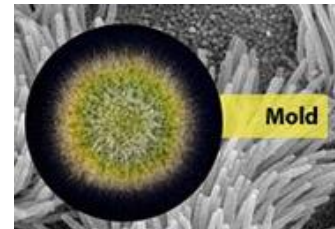
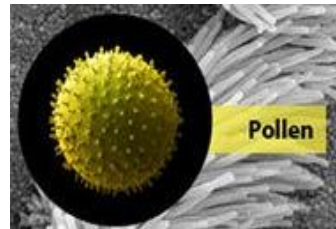
Major Air Pollutants

Major Air Pollutants



Natural Contaminants

4



Pollen

5

- “ Pollen is very fine powder that comes from trees, grasses, flowers.
- “ Wind and birds carry this pollen from plant to plant to fertilize them.
- “ When people who have a pollen allergy inhale the pollen, they get allergy symptoms.
- “ People can be allergic to different types of pollen.
- “ Some are allergic to pollen from only beech trees; others are allergic to pollen from only certain kinds of grasses.

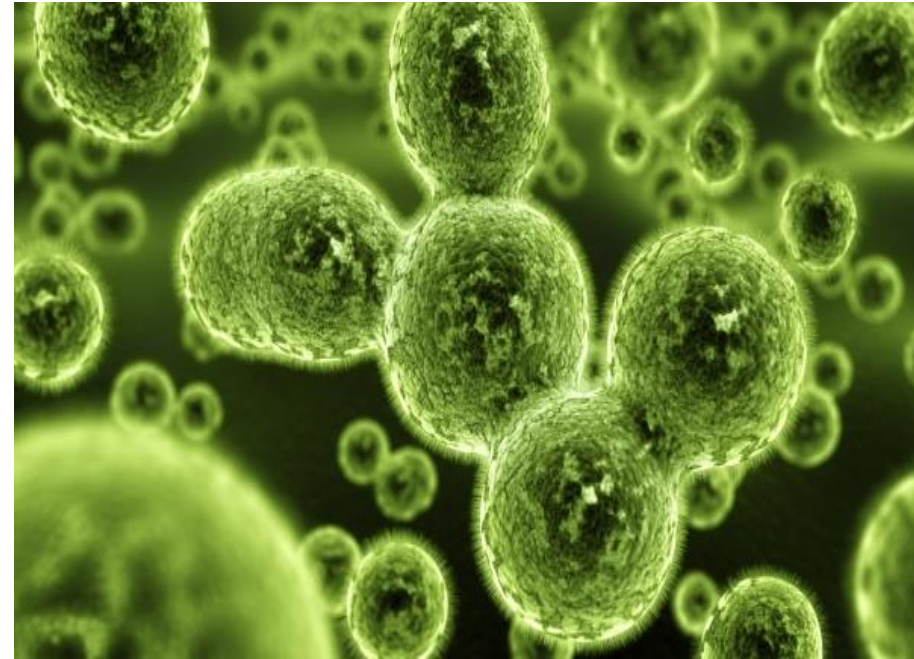


Mold

6

- “ Mold is a fungus, which makes spores.
- “ These spores float in the air like pollen.
- “ When people who have a mold allergy inhale the spores, they get allergy symptoms.
- Molds live indoors (especially in moist places like bathrooms, kitchens, and basements) and outdoors (on rotting logs and fallen leaves).

”



Aerosols

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“ An **aerosol** can be defined as a colloidal system in which the dispersion medium is a gas and the dispersed phase is solid or liquid.

OR

“ An aerosol is a colloid of fine solid particles or liquid droplets in air or another gas.

“ The term aerosols covers a wide spectrum of small particles, like sea salt particles, mineral dust, pollen, drops of sulphuric acid and many others

“ The term **aerosol** is used during the time it is suspended in the air.

Particulate Matter

- ” Particulate+refers to all substances that are not gases.
- ” It can be suspended droplets / solid particles / mixture of two.
- ” Size: 100 μm to 0.1 μm and less

Dust

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- “ Dust is made up of solid particles predominantly larger than those found in colloids and capable of temporary suspension in air or other gases.
- “ They do not tend to flocculate except under electrostatic forces.; they also do not diffuse but settle under the influence of gravity.
- “ These are formed by natural disintegration of rock and soil or by the crushing, grinding etc. of organic or inorganic materials.

Dust

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- “ Fly ash from chimneys varies from 3-80 μm
- “ Cement from 10-150 μm
- “ Foundry dust from 1-200 μm
- “ They have large settling velocities and are removed from the air by gravity and other inertial processes.
- “ Fine dust particles act as centers of catalysis for many of the chemical reaction-taking place in the atmosphere
- “ It contains particles of the size ranging from 1 to 200 μm .

Sources of Atmospheric Dust

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	Sources	Examples
1.	Combustion	Fuel burning (coal, wood, fuel oil) Incineration (house and municipal garbage) Others (open fires, forest fires, tobacco smoking)
2.	Materials handling and processing	Loading and unloading (sand, gravel, coal, ores, lime, cement) Crushing and grinding (ores, stone, cement, rocks, chemicals) Mixing and packaging (chemicals, fertilisers) Food processing (flour, corn starch, grains) Cutting and forming (saw mills, wall board, plastics) Metallurgical (foundries, smelters) Industrial (paper, textiles manufacture)

Sources of Atmospheric Dust

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	Sources	Examples
3.	Earth moving operations	Construction (road, buildings, dams, site clearance) Mining (blasting) Agriculture (soil filling, land preparation) Winds
4.	Miscellaneous	House cleaning Mud road cleaning Crop spraying Poultry feeding Engine exhaust

Smoke

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- “ It contains fine particles of the size ranging from **0.01 to 1 μm** which can be liquid or solid and are formed by combustion or other chemical processes.
- “ It consists predominantly of carbon particles and other combustible materials.
- “ The size of **coal smoke** particles range from **0.2-0.01 μm** and **oil smoke** particles from **1-0.03 μm** .

Smoke

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“ May have **different color** depending on the nature of material burnt.

White smoke: During cold start

Blue smoke: Burning of lubricating oil and additives

Black smoke: A product of incomplete combustion



Fumes

“ Fumes are formed when a metal is heated above its boiling point and its vapours condense into very fine, particles (solid particulates).

OR

“ It is consisted of the particles formed by condensation, sublimation or chemical reaction of which the predominant part consists of particles ranging from **0.1 μm to 1 μm** in size.



- Released from chemical or metallurgical processes.
e.g. tobacco smoke, condensed metal oxides

Fog and Mists

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Fog is a thick cloud of tiny water droplets suspended in the atmosphere at or near the earth's surface which obscures or restricts visibility (reducing visibility below 1 km).



Mist is a cloud of tiny droplets of water suspended in the atmosphere at or near the earth's surface that limits visibility to a lesser extent than fog.

Mist may result from the condensation of gases or vapors to liquid state.

They can also be formed by breaking up a liquid through splashing, spraying or foaming.

Classification of Air Pollutants

EPA description

Particle size

Super coarse

$$d_{pa} > 10 \mu\text{m}$$

Coarse

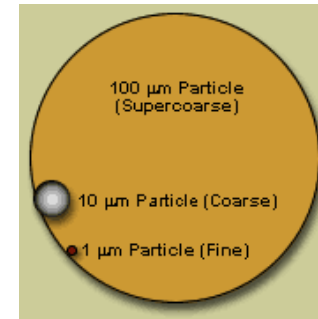
$$2.5 \mu\text{m} < d_{pa} \leq 10 \mu\text{m}$$

Fine

$$0.1 \mu\text{m} < d_{pa} \leq 2.5 \mu\text{m}$$

Ultrafine

$$d_{pa} \leq 0.1 \mu\text{m}$$



Particle size comparisons