

Industrial Hygiene

above 5μ in size usually will not remain airborne long enough to present an inhalation problem

Dust may enter the air from various sources. It may be dispersed when a dusty material is handled, such as when lead oxide is dumped into a mixer or a product is dusted with talc. When solid materials are reduced to small sizes in processes such as grinding, crushing, blasting, shaking, and drilling, the mechanical action of the grinding or shaking device supplies a source of energy to disperse the dust formed.

FUMES Solid particles generated by condensation from the gaseous state, generally after volatilization from molten metals. This physical change is often accompanied by a chemical reaction, such as oxidation. Fumes flocculate and sometimes coalesce.

A fume is formed when a volatilized solid, such as a metal, condenses in cool air. The solid particles that make up a fume are extremely fine, usually less than 1.0μ . In most cases, the hot material reacts with the air to form an oxide. Examples are lead oxide fume from smelting, and iron oxide fume from arc welding. A fume can also be formed when a material such as magnesium metal is burned or when welding or gas cutting is done on galvanized metal.

Odorous gases and vapors are *not* fumes. Newspaper columnists commonly misuse this term and refer to carbon monoxide as a fume.

SMOKE Carbon or soot particles less than 0.1μ in size which result from the incomplete combustion of carbonaceous materials such as coal or oil. Smoke generally contains droplets as well as dry particles. Tobacco, for instance, produces a wet smoke composed of minute tarry droplets. The size of the particles contained in tobacco smoke is about 0.25μ .

AEROSOLS Liquid droplets or solid particles dispersed in air, that are of fine enough particle size to remain so dispersed for a period of time.

MISTS Suspended liquid droplets generated by condensation from the gaseous to the liquid state or by breaking up a liquid

into a dispersed state, such as by splashing, foaming, or atomizing. Mist is formed when a finely divided liquid is suspended in air. Examples are the oil mist produced during cutting and grinding operations, acid mists from electroplating, acid or alkali mists from pickling operations, paint spray mist from spraying operations and the condensation of water vapor to form a fog or rain.

GASES Normally formless fluids which occupy the space of enclosure and which can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature. Gases diffuse. Examples are welding gases, exhaust gases, and air.

VAPORS The gaseous form of substances which are normally in the solid or liquid state (at room temperature and pressure). The vapor can be changed back to the solid or liquid state either by increasing the pressure or decreasing the temperature alone. Vapors also diffuse. Evaporation is the process by which a liquid is changed into the vapor state and mixed with the surrounding air. Solvents with low boiling points will volatilize readily.

The safety professional will recognize that air contaminants exist as a gas, dust, fume, mist, or vapor in the workroom air. In evaluating the degree of exposure the measured concentration of the air contaminant is compared to limits which appear in the published standards on levels of exposure. (These are published in the next chapter.)

In addition to the definitions of states of matter, which find daily usage in the vocabulary of the industrial hygienist, other terms used to describe degree of exposure are

ppm—Parts of vapor or gas per million parts of contaminated air by volume

mppcf—Millions of particles of a particulate per cubic foot of air

mg/m³—Milligrams of a substance per cubic meter of air

micrograms/l—Micrograms of a substance per liter of solution

Annually the American Conference of