Its solubility in water, like all gases, is dependent upon the temperature and partial pressure. Nernst (Festschrift, 391; 1912) gives the solubility coefficient for water at 0 deg. cent. and 760 m.m. Hg., as 0.494; or about ten times as great as oxygen. However, high concentrations of ozone, in solution, in water, are not easily obtained in practice, due to the low concentrations at which ozone is available commercially. Of the two factors, temperature appears to have the greatest bearing.

CHEMICAL REACTIONS INVOLVING OZONE

Ozone is one of the strongest oxidizing agents known. It is capable of oxidizing all of the elements, with the exception of gold and some of the metals of the platinum group.

In the dry state its activity towards metals is not so marked, and in very low concentrations, such as used in ventilation, it may be considered as being practically inert towards the common metals.

It exerts a depolymerising action on the rubber molecule, its destructive effect being quite characteristic even at comparatively low concentrations (ca. 3 to 4 ppm). However, unless the rubber is under stress, fairly high concentrations (ca. 50 to 100 ppm), fail to effect it appreciably. The low concentrations used in ventilation have no noticeable effect on ordinary rubber goods.

Iodine is liberated from potassium iodide by ozone. Many of the low oxidation salts (ous salts) are carried to a higher degree of oxidation (ic salts) by ozone.

Generally, ozone reacts to liberate molecular oxygen, only the third atom entering into combination. This may be expressed by the equation:

$$M + O_3 = MO + O_2 \qquad (1)$$

which is typical of the inorganic reactions of ozone. In many cases, however, ozone reacts as follows:

$$M + O_3 = MO_3 \qquad (2)$$

This reaction is exemplified in the oxidation of sulphur dioxide:

$$3SO_2 + O_3 = 3SO_3$$

Reaction (2) is more typical of the organic, than the inorganic, reactions of ozone, as illustrated by the oxidation of urea:

$$CO(NH_2)_2 + O_3 = N_2 + CO_2 + 2H_2O \qquad (3)$$

In the oxidation of odoriferous substances, commonly met with in ventilation, such as skatole, indole, amine compounds, and the like, reaction (3) may be said to hold throughout. Where an amino group is present, molecular nitrogen will be produced, in addition to the carbon dioxide and water produced from hydrocarbons.

EFFECT OF OZONE ON MICRO-ORGANISMS

Ozone compared with other gaseous germicides, generally used for fumigation, rightfully holds first place, as is revealed by the following table:

Agent	Per cent necessary in moisted air to be germicidal
Ozone	0.1
Formaldehyde	1.0
Sulphur Dioxide	4.5

One-tenth per cent by weight, of ozone in air is equivalent to approximately 560 parts per million. Such a concentration of ozone could never be used in ventilating work. Rideal (Ozone, D. Van Nostrand) cites 0.05 per cent concentration as germicidal in air. Hill & Aeberly (*Heating and Ventilating Magazine*, February, 1922), report noticeable bacteriacidal effects in concentrations ranging from 300 to 450 ppm by volume. Ozone, even in respirable concentrations, is effective in inhibiting the development of fungi in cold storage; however, its action is inhibitory and not destructive.

ODORIFEROUS SUBSTANCES

T. Graham has pointed out that odoriferous substances are susceptible to oxidation. It is further known that most odoriferous substances contain unsaturated valencies, which render them particularly susceptible to attack by ozone.

The so-called odors of animal effluvia, frequently encountered in crowded places and where a large percentage of the air is recirculated, consists of low oxidation gases, and while present only in vanishingly small quantities, are highly odoriferous. These gases are completely and rapidly oxidized to odorless and innocuous products by ozone.

Hydrogen sulphide is thrown off in small quantities by man, and is frequently present in the air in relatively large quantities, as the result of many industrial operations. Ozone oxidizes hydrogen sulphide very rapidly; under some conditions to sulphuric acid and under other conditions to free sulphur and water.

Products of putrefaction, such as trimethylamine, indole, skatole, the mercaptans, etc., are readily oxidized by ozone, as are the odors arising from foods, especially during cooking. Many of the odors resulting from the combustion of organic matter are destroyed. The odor of pyridine in tobacco smoke is destroyed and not masked by ozone. Sulphurous gases produced by the combustion of coal are completely oxidized, while many of the unsaturated gases resulting from the incomplete combustion of natural gases, oil and spirit fuels, are deodorized by ozone.

Carbon monoxide is but slowly oxidized to the dioxide, the reaction being accelerated by the presence of a catalyst and also at elevated temperatures. However, the molecular concentrations of ozone must be comparable, and preferably in excess of, that of the CO, in order to obtain reaction velocities of sufficient value for practical purposes.

In garages and testing rooms the air is frequently contaminated with gasoline vapors and unsaturated gases, resulting from incomplete combustion, which cause headaches and feelings of lassitude. Ozone is valuable in oxidizing these gases and freeing the air from odor. However, CO must always be taken into consideration. It is an odorless and very insidious poison, since the victim has little warning of his condition until coma is induced. Four parts of CO per ten thousand of air is the maximum concentration which may be respired continuously without noticeable effect. (Henderson, Yandell, et al—*Journal. Ind. Hyg.* Vol. 3, 1921). Carbon monoxide frequently has been found present in quantities much greater than four parts per ten thousand in the atmosphere of garages