

SUBJECT - CHEMISTRY

CLASS - BSc(Hons) PART- I

PAPER : I

GROUP : A

TOPIC : CHEMISTRY OF OZONE

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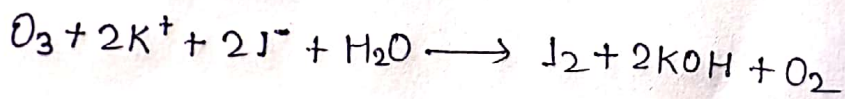
O_3 is an unstable, dark blue diamagnetic gas, b.p. $-112^\circ C$. The colour is due to intense absorption of red light (λ 557 and 602 nm). It also absorbs strongly in the UV region (λ 255 nm). This is particularly important since there is a layer of O_3 in the upper atmosphere which absorbs harmful UV radiation from the sun, thus protecting people on the earth. The use of chlorofluorocarbons in aerosols and refrigerators, and their subsequent escape into the atmosphere, is blamed for making holes in the ozone layer over the Antarctic and Arctic. It is feared that this will allow an excessive amount of UV light to reach the earth which will cause skin cancer (melanoma) in humans. Oxides of nitrogen (from car exhausts) and the halogens can also damage the O_3 layer. O_3 has a characteristic sharp smell, often associated with sparking electrical equipment. The gas is toxic, and continuous exposure to concentrations of 0.1 ppm must be avoided.

O_3 is usually prepared by the action of a silent electric discharge upon dioxygen between two concentric metallized tubes in an apparatus called an ozonizer. Concentrations of up to 10% of O_3 are obtained in this way. Higher concentrations or pure O_3 can be obtained by fractional liquefaction of the mixture. The pure liquid is dangerously explosive. Low concentrations of O_3 can be made by UV irradiation of O_2 .

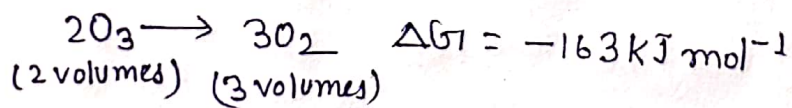
This occurs in the atmosphere when photochemical smog is formed over some cities, for example over Los Angeles or Tokyo the photochemical change is useful for producing low concentrations to sterilize food, particularly for cold storage. O_3 can also be made by heating O_2 to over $2500^\circ C$ and quenching. In all of these preparations oxygen atoms are produced, and these react with O_2 molecules to form O_3 .

O_3 is also used as a disinfectant. for example, it is used to purify drinking water, since it destroys bacteria and viruses.

The amount of O_3 in a gas mixture may be determined by passing the gas into a KI solution buffered with a borate buffer (pH 9.2) the iodine that is liberated is titrated with Sodium Thiosulphate.



Alternatively the gas may be decomposed catalytically, and the change in volume measured.



O_3 is thermodynamically unstable, and decomposes to O_2 . The decomposition exothermic, and is catalysed by many materials. The solid and liquid often decompose explosively. The gas decomposes slowly, even when warmed, providing catalysts. and UV light are absent. O_3 is an extremely powerful oxidizing agent, second only to F_2 in oxidizing power, and reacts much more readily than dioxygen.

