NOTE

Structure of Oxygen

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This paper explains the structure of oxygen on the basis of valence bond theory

Oxygen is the most abundant element in the Earth's crust on the basis of mass. Almost half the mass of the earth's crust is due to oxygen.

In the free state, oxygen occurs in the atmosphere as O_2 molecules. The molecule is diatomic and paramagnetic to the extent of two unpaired electrons per molecule[1].

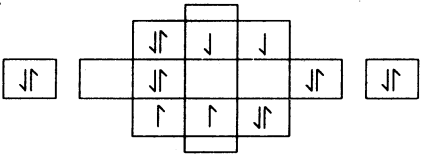
Its electronic formula can be given as $:\dot{\underset{\cdot\cdot}{O}}:\dot{\underset{\cdot\cdot}{O}}:$ but this clearly violates the octet rule.

Valence-shell-electron-pair repulsion, often designated as VSEPR theory, can be used to solve this problem.

The VSEPR theory says that the arrangement of bonds around an determined by the number of electron paris around an atom and the size and shape of the orbitals in which the electrons are placed. The assumption is that these electron pairs will arrange themselves so that least repulsion occurs between them. In other words electron pairs tend to get as far apart as possible. For example, if there are two electron pairs the preferred arrangement will be to have one pair on each side of the atom[1].

In a nutshell if an electron pair in the valance shell of an atom is not used to bond an atom but resides in the valance shell as a "lone pair", then it will occupy a linear position as far apart as possible. In the same way "lone-pair" will remain as far apart as posible in molecules also.

In case of oxygen molecules the lone pair of each oxygen atom tend to get as far apart as possible.



In this structure, both single unpaired electrons are trapped by "lone-pair" of neighbouring oxygen. In this way oxygen becomes *inactive* or oxygen maintains octet effect with seven electrons in its outer shell.

REFERENCES

1. Sienko, Plane Chemistry, McGraw-Hill International, New Delhi (1984).

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