ISSN:2249-5347
IJSID
International Journal of Science Innovations and Discoveries
An International peer Review Journal for Science

Nobel Prize in Chemistry 1913

Alfred Werner

The Nobel Prize in Chemistry 1913 was awarded to Alfred Werner *"in recognition of his work on the linkage of atoms in molecules by which he has thrown new light on earlier investigations and opened up new fields of research especially in inorganic chemistry"*.

RESEARCH INFORMATION:

The Royal Academy of Sciences has awarded this year's Nobel Prize for Chemistry to Alfred Werner, Professor in the University of Zürich, "for his work on the linkage of atoms in molecules, by which he has thrown new light on earlier investigations and opened up new fields of research especially in inorganic chemistry".

The concept of valence on which all modern chemical theory is based had been found unable to deal with a large and important group of mainly inorganic compounds, the so-called complex or molecular compounds, because it was unable to provide a satisfactory explanation of their internal structure. By considerably expanding and modifying the former concept of valence, Werner both illuminated the area concerned and opened up new paths for research.

ISSN:2249-5347
IJSID
International Journal of Science Innovations and Discoveries
An International peer Review Journal for Science

By contrast with the conventional view, Werner does not conceive of the binding forces of an atom as being divided into certain units of affinity determined in number and direction. He considers affinity rather to be a force issuing from the centre of the atom, uniformly attractive in all directions, whose geometrical expression is therefore not a given number of guiding lines, but a spherical surface. Atoms or atom groups which can occur as ions or whose chemical binding capacity is equivalent thereto, can enter bonds in the manner previously indicated by means of the so-called *primary valences*. These do not however represent the sum total of affinities; the remaining residual affinities or *secondary valences*, whose energy content is assumed to be less than that of the primary valences, but which do not otherwise in principle differ from them, bring about bonds with atomic complexes which cannot occur as independent ions, e.g. water, ammonia, potassium chloride, etc. and thus make provision for compounds of higher order, so-called addition and intercalation compounds.

The number of atoms or groups of atoms which can be linked in a first sphere with the elementary atom functioning as centre, or which in other words can be coordinated into complex radicals under direct linkage with an atom, Werner calls the *coordination number*. This is a dearly defined numerical concept which is superior to other numerical concepts designed to characterize affinity saturation in that it is to some extent independent of the nature and valence of the interconnected elementary atoms, in so far as it has the same value for the great majority of elements. Only two such numerical values have been demonstrated as yet, i.e. four for some elements, and six for the others.

By this approach of which only some principal characteristics can be mentioned here, Werner explains the structure and origin of complex inorganic compounds. By widening and deepening the concept of valence which incorporates his view he has succeeded in bringing atomistic and molecular compounds together under a common point of view. He has drawn a large number of diverse compounds into the range of his comprehensive expert mental work and has thereby been able to establish a uniform

system for large groups of inorganic compounds. Werner's approach has also exerted significant influence on research in organic chemistry.

Werner's theory has been supported in an extremely important and valuable manner by the stereochemical researches which he carried out as a sideline, mostly in connection with his work on the constitution of chemical compounds.

By virtue of his theory of the asymmetrical carbon atom, van't Hoff became the real founder of the stereochemistry of organic compounds, and it is Werner's indisputable merit to have introduced this approach to inorganic chemistry as well. Even in his earlier investigations into certain metal ammonias he was able to show that numerous cases of isomerism in complex cobalt and platinum compounds could only be satisfactorily explained by steric approach. For complex radicals of a certain type he put forward a steric theory - the octahedron theory - which predicted that certain of these compounds must occur in two stereoisomeric forms, a prediction which has been confirmed by experiment. By far the greatest interest in this field attaches also to the discovery he made in the last few years, that certain cobalt, chromium, iron, and radium compounds with an asymmetrical metal atom in the complex radical can be divided into two forms which behave like mirror images and show differences of the same kind as those in organic mirror-image isomers, i.e. they are optical antipodes of each other. This discovery is a splendid support for Werner's theory. It has been called the most important discovery in chemistry in recent times, and his stereochemical work makes him the founder of inorganic stereochemistry.

As to Werner's research work as a whole we can with good reason agree with the remark of an eminent research worker, that Werner's theoretical and experimental work in inorganic chemistry has opened up new paths of chemical research and is of positively revolutionary significance. It is substantially his researches which have during the last few decades set the trend of development in inorganic chemistry and have newly inspired this branch of science which had been somewhat neglected during the last quarter of the 19th

century, by giving it new impulses which have borne fruit in numerous different special studies by various research workers.

For more details please visit:

http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1913/press.html