

Nobel Prize in Chemistry 1976



William N. Lipscomb

The Nobel Prize in Chemistry 1976 was awarded to William Lipscomb "for his studies on the structure of boranes illuminating problems of chemical bonding".

Information about winners:

William N. Lipscomb,
Harvard University, USA,

RESEARCH INFORMATION:

CHEMISTRY PRIZE FOR THE STRUCTURE OF THE BORANES

The studies for which William Lipscomb has been awarded the Nobel Prize are related to the chemistry of boranes. "Boranes" is the now accepted name for boron hydrides, i.e. the compounds of the element boron with hydrogen. There are a great number of boranes but very little was known about them for a long time. As a rule they must be studied at a very low temperature, they are usually unstable and chemically aggressive, explosive and toxic. For a long time no one really knew how the borane molecules are constructed and it was obvious that the conditions necessary for bonding were very different from those already known in other fields of chemistry.

One might suppose that the bonds between the atoms of the boron hydrides were similar to those between the atoms of hydrocarbons. In the latter, a pair of electrons are

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generally the bonding agents between two neighbouring atoms. However, boron has not as many bonding electrons as carbon and therefore all the bondings cannot be of this type. One type of bonding which might remedy this lack of electrons was suggested in 1949 but it was not until Lipscomb's works from the beginning of 1950s onwards that the problems in borane chemistry could be satisfactorily solved. Not only has Lipscomb studied the pure electrically neutral borane molecules but he has also investigated charged borane molecules i.e. ions, and other molecules closely related to the boranes.

Lipscomb has tackled the problems with skillfull topological methods enabling him to identify the possible combinations of feasible types of bonding. With his fellow scientists he has determined the geometric structures by means of X-ray diffractions and by using modern quantum mechanical calculations has been able to determine and, in many cases, predict the stability and reactions of the molecules under varying conditions. Knowledge of the great subject field, covering the boranes and related chemical compounds, has thus been enormously enriched, at the same time as scientists have gained a deeper insight into the nature of chemical bonding.

Lipscomb has tackled the problems on a broad front, working in a little known field that is difficult to penetrate, and he has been the leading figure in the advances made there. The breadth of Lipscomb's scientific achievement is also demonstrated by the eminent work he has done in other fields of chemistry. To mention but one, he has made notable findings in studies of the structure and mechanisms of enzymes.

For more details please visit:

http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1976/press.html