RESEARCH PAPER | Science | Volume : 3 | Issue : 7 | July 2013 | ISSN - 2249-555X

New Innovative Methods for IUPAC Nomenclature of Bicyclo and Spiro Compounds in Organic Chemistry

KEYWORDS: Fused ring system, Bicyclo, Spiro, Common points (CP), Big, Small.

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ABSTRACT *IUPAC nomenclature of bicyclo and spiro compounds is a vitally important to students of organic chemistry in graduate and also in post-graduate level. This new innovative method has to be introduced for informal determination of IUPAC nomenclature of bicyclo and spiro compounds in a very simple way, which is also be a time savings one.*

INTRODUCTION

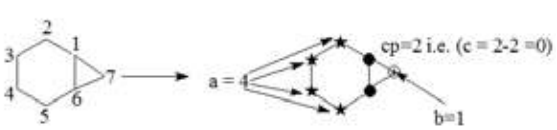
The method which is generally used for determination of IUPAC nomenclature of bicyclo and spiro compounds[1,2,3] is time consuming. To keep the matter in mind a new innovative method has to be introduced for determination of IUPAC naming of bicyclo and spiro compounds in a very simple way, which is also be a time savings one. Another two innovative methods also to be introduced earlier on the easy prediction of 'Hybridization' and 'Bond-Order' [4,5] for the benefit of students.

New Innovative Rules For Nomenclature of *Bicyclo* Compounds

Compounds containing two fused rings are named as *bicyclo* compounds. Incase of *bicyclo* compounds the **common points** of two fused rings are **at least 02 (two)**. It may be more than two i.e. it may be three, four etc. but not less than two. The **common points** (cp), may also be **treated as carbons,** which are common in two fused rings.

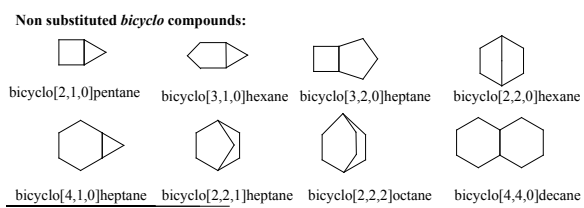
The **format** of writing of IUPAC nomenclature for **non substituted *bicyclo* compounds** is **'bicyclo[a,b,c]alkane'** and for **substituted *bicyclo* compounds** are **'x-substituent bicyclo[a,b,c]alkane' (in presence of only one substituent); 'x-substituent name bicyclo[a,b,c]alkene/alk-y-ene' (in presence of one double bond and one substituent) ; 'x,x-disubstituent name bicyclo[a,b,c]alkene/alk-y-ene' (in presence of one double bond and two same substituents) and 'x,x-disubstituent name bicyclo[a,b,c]alka-y,z-diene' (in presence of two double bonds and two same substituents).** Here **'a'** and **'b'** are the maximum and minimum number of points respectively in the fused ring system excluding common points and **variable 'c' = no of common points (cp) – 2;** x = position no of the substituents present in the ring system; y and z = position numbers of the double bonds and the suffix **'alkane'** corresponding to the total number of points/ carbons in the fused ring system including common points.

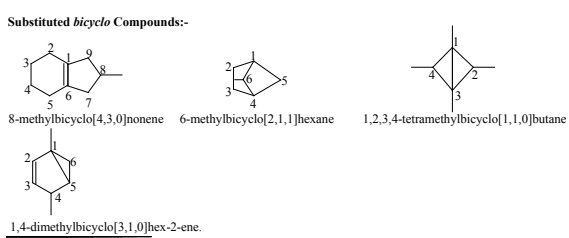
Since in '***b**icyclo*', **'b'** stands for '**big' i.e. supreme (maximum),** so, during IUPAC naming first we write in the third parenthesis '[ ]', maximum no of points followed by **minimum (least)** no of points and then write variable number **'c'** always accomplish by the **deduction** of **02 (two)** from the total number of common points [i.e. **variable c** = no of common points (cp) – 2]. Sometimes, where **a = b**, then write **'a'** after **'b'** or vice versa.



Bicyclo[4,1,0]heptane {Here the maximum no of points, '**a' = 4,** are denoted by asterisk mark, minimum no of points, **'b'=1,** are denoted by positive sign and common points, **cp = 2,** are denoted by shadow circle.}

In case of **substituted *bicyclo* compounds numbering** is to be started from the **one bridgehead** and is continued to the **next longest bridge** and thus the shortest bridge is numbered later on.





New Innovative Rules For Nomenclature of *Spiro* Compounds:-

In *Spiro* compounds two rings are passing through only one point elected as common point. **In such case, common point (cp) is always one.**

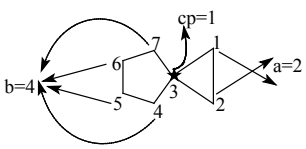
The **format** of writing of IUPAC nomenclature for **non substituted *spiro* compounds** is **'spiro[a,b]alkane'** and for **substituted *spiro* compounds** are **'x-substituent name spiro[a,b]alkane' (in presence of only one substituent); 'x-substituent name spiro[a,b]alkene/alk-y-ene' (in presence of one double bond and one substituent) ; 'x,x-disubstituent name spiro[a,b]alkene/alk-y-ene' (in presence of one double bond and two same substituents) and 'x,x-disubstituent name spiro[a,b]alka-y,z-diene' (in presence of two double bonds and two same substituents).** Here **'a'** and **'b'** are the minimum and maximum number of points respectively in the fused ring system excluding common point (cp); x = position no of the substituents present in the ring system; y and z = position numbers of the double bonds and the suffix 'alkane' corresponding to the total number of points i.e. carbon atoms in the ring system including common point.

Since in '***spiro***', **'s'** stands for '**small' i.e. minimum ,** so, dur-

Volume : 3 | Issue : 7 | July 2013 | ISSN - 2249-555X

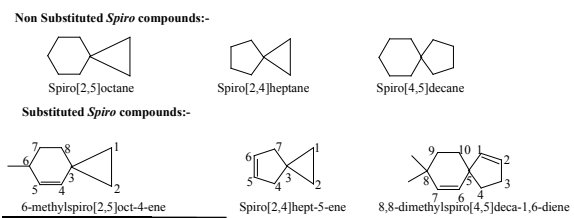
ing IUPAC naming of *spiro* compounds first write in the third parenthesis '[ ]', minimum no of points **'a'** followed by maximum no of points **'b'** . Sometimes, where **a = b**, then write **'a'** after **'b'** or vice versa.

In case of **numbering** of **substituted spiro compounds** always give **priority** to the **smaller ring system** and the numbering starts from the atom next to the common point (cp) and proceeds to the smaller ring first and bigger ring later on.



Spiro[2,4]heptane

{Here the minimum no of points, '**a' = 2,** and maximum no of points, **'b'=4,** are denoted by arrow mark and the common point, **cp = 1,** are denoted by asterisk mark .}



CONCLUSIONS:

This article is very helpful to students in chemistry of graduate and also in Postgraduate level. This is one of the very time savings method. By using this method student can predict bond order in a very simple way.

ACKNOWLEDGEMENT:

Author would be grateful to **Prof. R.N.Mukherjee, Director, IISER, Kolkata; Prof.G.N.Mukherjee**, **Sir Rashbehary Ghose Professor of Chemistry, Calcutta University,** India,; **Prof.A.K.Das,** Ex **Vice-Chancellor** of Kalyani University, **Prof.R.A.Lal, Head, Dept. of Chemistry, NEHU, Shillong, Prof. Md.Ali, Dept. of Chemistry, Jadavpur University**, **Prof. R.K.Nath**, **Head**, Deptt. of Chemistry, **Tripura Central University** for their recognition in this regard.

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