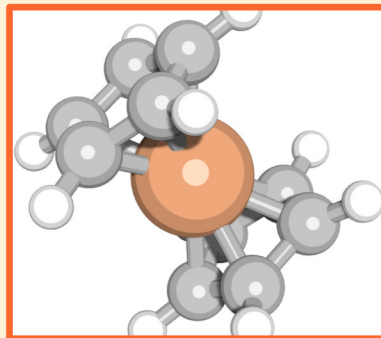


HIGHLIGHTS

- A simplified assignment of the stereochemical descriptor for a cyclophane based on a stereocentre.
- The stereochemical descriptor for a cyclophane based on helicity.
- The stereochemical descriptor for a metallocene based on a stereocentre.
- The stereochemical descriptor for a metallocene based on planar chirality.



If you thought defining the configuration of axially chiral compounds was tricky you ain't seen nothing yet! Planar chirality takes nomenclature to a whole new level ...

Cyclophanes and metallocenes are treated differently, even though they are both classed as planar chiral.

Cyclophanes can either be given a point chiral descriptor (*R* or *S*, but normally with addition of a 'p') or described as a helix (*P* or *M*). The configuration of a metallocene should also be based on a stereocentre (*R* or *S*) but is frequently assigned by planar chirality (*R_p* or *S_p*). But the method of both is different to that used with cyclophanes.

Let the fun commence ...



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CHEMISTRY
CLASSICS

STEREOCHEMICAL DESCRIPTORS

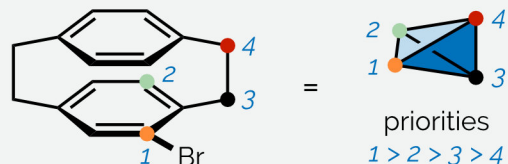
PLANAR CHIRALITY



The descriptors for planar chirality

1. Cyclophanes R_p/S_p

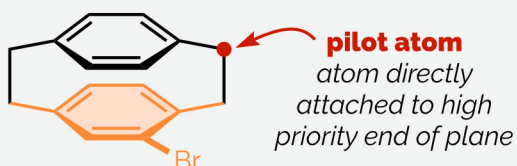
The descriptor should be based on a stereogenic centre but is simplified.



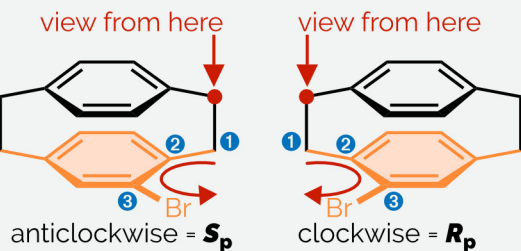
(i) **identify stereogenic plane** - plane with most atoms



(ii) **identify pilot atom** - first atom attached directly to, but out of, the plane



(iii) **number atoms 1-3** - start adjacent to pilot atom & move towards highest priority atom. Connect 1→2→3 with arrow.



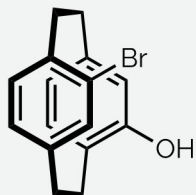
(iv) **assign descriptor** - if arrow, when viewed from the pilot atom, rotates clockwise = R_p ; anticlockwise = S_p .

o. Priorities

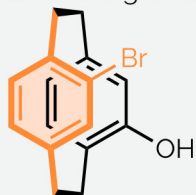
Use CIP priorities found [HERE](#).

2. Cyclophanes P/M

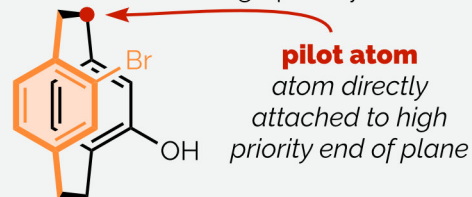
A stereogenic plane of a cyclophane can be described as a helix.



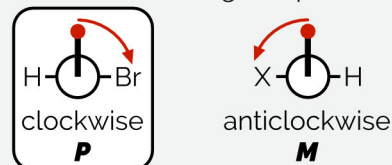
(i) **identify stereogenic plane** - plane with most atoms (or highest priority)



(ii) **identify pilot atom** - first out-of-chiral plane atom at the high priority end



(iii) **draw Newman projection** - with pilot atom at front & stereogenic plane at rear



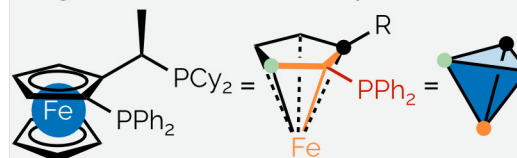
(iv) **assign descriptor** - if pilot atom is rotated clockwise into plane of highest priority group = P ; anticlockwise = M .

2b. R/S vs. P/M

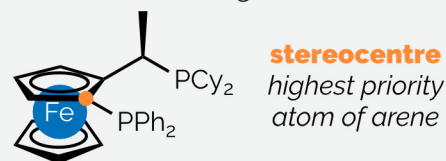
For stereogenic axis $S_a = P$ & $R_a = M$.
For stereogenic plane $S_p = M$ & $R_p = P$.

3. Metallocenes R/S

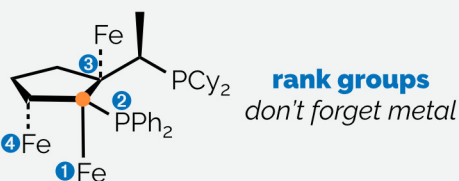
Treated as a stereogenic centre comprising of three atoms in the arene ring bonded to the metal by σ bonds.



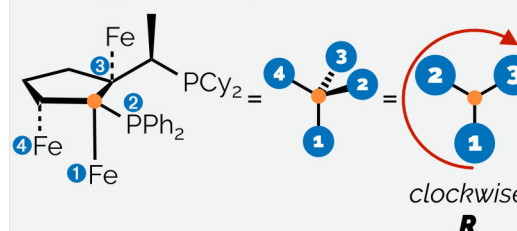
(i) **identify stereocentre** - highest priority atom of the arene ring



(ii) **rank atoms** - attached to stereocentre in normal manner



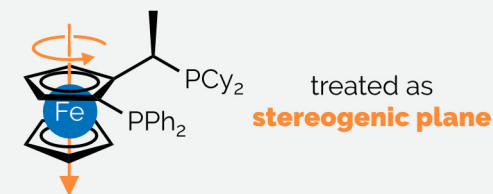
(iii) **orientate molecule** - so lowest priority points away from viewer



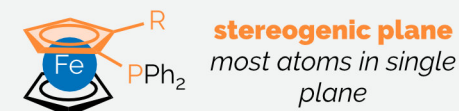
(iv) **assign descriptor** - if a line connecting 1→2→3 is clockwise, descriptor = R ; otherwise = S

4. Metallocenes R_p/S_p

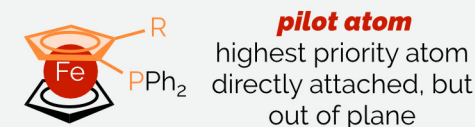
Older convention has configuration described by stereogenic plane.



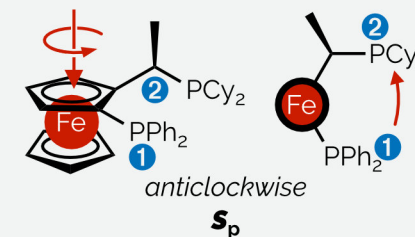
(i) **identify stereogenic plane** - plane with most atoms



(ii) **identify pilot atom** - highest priority atom directly attached to stereogenic plane. Invariably the metal



(iii) **identify two highest priority groups** - attached to arene ring using CIP rules.



(iv) **assign descriptor** - view ring from face opposite pilot, if arrow connecting 1→2 is clockwise = R_p ; anticlockwise = S_p

5. Metallocenes

Two conventions. Box 3 is the recommended nomenclature but Box 4 still common. Best method to unambiguously communicate structure is through a drawing.