



# Stereoisomers and their Configurational Analysis in Chemical Methods with Significance

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## DESCRIPTION

A stereoisomer is an isomer in which atoms with the same partners arranged differently in space. Stereoisomers are known to have isomeric molecules with the same molecular constitution, but with different three-dimensional spatial arrangement of the atoms. They can be broadly classified as enantiomers and diastereomers. Different enantiomers bind to different receptors and possibly bring different responses. For this reason, stereoselective methods are valuable tools in the pharmaceutical, food and agricultural fields. Liquid chromatography and supercritical fluid chromatography are the most common techniques used for chiral separation.

Stereoisomers have the same connectivity, but differ in the way their constituent atoms are oriented in space. They can be divided into configurational stereoisomers and conformational stereoisomers. The identification of the spatial arrangement of groups in a configurational isomer is called its configuration, and its conformation in a conformational isomer.

### Configurational stereoisomers

These stereoisomers cannot be superimposed by rotation around a single bond. In order to make them superimposable requires rotation around a double bond or dissociation of one or more single bonds, or both. These processes usually require a lot of energy and usually do not occur at a measurable rate at room temperature. Configurational stereoisomers are usually separated from each other and stored essentially indefinitely at room temperature.

### Conformational stereoisomers

These stereoisomers are often abbreviated as conformers and can be superimposed by rotating them around a single bond. Examples are the axial and equatorial conformers of monosubstituted cyclohexane. Rotation around a single bond is usually very facile that it is usually not possible to separate the

conformers from each other and treat them separately at room temperature.

### Chirality

Another important classification of stereoisomers into two groups is related to optical activity. This is represented by the rotation of the plane of polarized light on passage through the sample.

Pair of stereoisomers that are related to one another in the same way as an object and its mirror image are called enantiomers.

Any pair of stereoisomers that are not related in this way are called diastereomers.

Molecules that are not identical to the mirror image are said to be chiral and occur as a pair of enantiomers. A necessary and sufficient condition for chirality is that there is absence of an improper rotational axis of symmetry in the molecule (this includes center of inversion center and mirror plane symmetry elements).

A mixture of two equal amounts of enantiomers is called racemic modification and is optically inactive. An unbalanced mixture of pure enantiomers or two enantiomers is optically active. The two enantiomers have opposite handedness and rotate the plane of polarization in opposite directions.

## CONFIGURATIONAL ANALYSIS OF STEREOISOMERS IN CHEMICAL METHODS

If the stereoisomers have two suitable functional groups in close proximity to each other, they will undergo a reaction to form a new compound and help assign the relative configuration to the two diastereoisomers. Such a method was demonstrated by Freudenberg to distinguish between the two diastereomers of dihydroshikimic acid.

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In the case of cyclic 1,2-diols, the reaction of periodic acid or lead tetraacetate that causes the cleavage of the C-C bond is the rate of the cis-1,2-diol and trans-1,2-diol of the normal ring with a small cycloalkanes. The rate for cis isomer is higher and in some instances the trans isomer may not undergo the reaction. Such correlations depend on the type of the functional groups present in the diastereomers, and many possibilities exist for application of this methodology.

## SIGNIFICANCE

The Stereoisomerism of molecules forms an indispensable concept in molecular science. The character isomers are

complicated by cyclic structures such as saccharides, but were established to form the basic knowledge of chemistry. A unique type of isomerism arises when the dynamic stereoisomerism is involved in the steric isomerism of the cyclic structure. Such perplexing dynamic character isomers are involved in a band-shaped cyclic arrays of aromatic molecules recently known as carbon nanohoops, but has scarcely been clarified to date.