Types of isomers and suitable HPLC columns for separation – Tips & Suggestions

There are many types of chemical isomers, and each may require different approaches to obtain chromatographic separation. Some examples are as follows:

Empirical Isomers: These compounds have the same empirical formula but the atoms could be arranged in any possible configuration. This is the most general type of isomer. Knowing all of the possible isomers for a given empirical formula becomes important in LC-MS, where you can obtain an m/z value for a peak but not quite the actual structure. The Cogent Diamond Hydride™ is well suited for polar compounds and often for these types of isomers.

Positional Isomers: These compounds differ in where a group is arranged on the structure. Common examples are ortho, meta, and para substituents on an aromatic ring. The Cogent Phenyl Hydride™ column is often well-suited to these compounds.

E/Z or Cis/Trans Isomers: These compounds differ in how the substituents are arranged on a double bond. If there are C-H groups on both parts of the double bond, they can be termed cis or trans. Cis is where the C-R groups are on the same side of the double bond and trans is where they are on opposite sides (where R is any atom except H). If there are three or four C-R groups on the double bond, then it must be termed E or Z. Using the Cahn-Ingold-Prelog rules, priorities can be assigned to each substituent. Then, the groups with the highest priorities are termed Z if they are on the same side or E if they are on opposite sides. E or Z is more general than cis or trans and can be used for any double bond isomers. The Cogent UDC-Cholesterol™ column is often good for these compounds because it can differentiate based on shape.

Stereoisomers: These compounds differ in one or more chiral centers. There are various types of stereoisomers. Enantiomers differ from each other at all chiral centers and have identical physical properties in an achiral environment. What this means for the chromatographer is that they cannot be separated by conventional means and require a chiral stationary phase not offered by MicroSolv. **Diastereomers** differ by one or more (but not all) chiral centers. **Epimers** are diastereomers that differ in only one chiral center. Not all compounds which have chiral centers are chiral. If they have a plane of symmetry, they are called meso and are not chiral.

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