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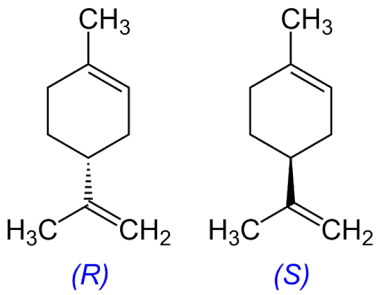
Limonene Infosheet

Limonene (4-isopropenyl-1-methylcyclohexene) is a chiral cyclic monoterpene, with the molecular formula $C_{10}H_{16}$ This chiral compound exists in two isomeric forms, which are stereoisomers; in other words, molecules with the same structure but with different orientations of the same atoms in space. The two forms of limonene differ only in the configuration of the groups around a single carbon atom. The two forms are mirror images (=enantiomers) of each other that can only be interconverted by breaking and forming covalent bonds.



Molecular Formula	$C_{10}H_{16}$
Molecular Weight	136.23
Synonyms	D-Limonene, (*R*)-(+)-Limonene L-Limonene, (*S*)-(−)-Limonene

D-Limonene is a major component of the oil in citrus peels, which also contains citrus limonoids. The less common L-limonene is found in herbs like caraway. Industrial limonene comes from the peel of citrus fruits as a waste product of fruit processing for the production of juices. For this reason, it is produced as the *R* enantiomer (D-limonene). It is used as a fragrance compound and for degreasing.

Image: Cristina Anne Costello/Unsplash

Like all enantiomers, the two forms are indistinguishable in most chemical/physical tests. They do, however, rotate the plane of polarized light in opposite directions. Thus, it is possible to distinguish the enantiomers by using a polarimeter. The enantiomers are also easily distinguished biologically. D-limonene (the *R* form) has a sweet citrus odour, while the L form has a has a sharper resinous or turpentine-like odour. Our noses are very sensitive and able to distinguish these very similar compounds because the olfactory receptors in the nose have molecular sites that interact specifically with different enantiomers