Due to the ongoing biological revolution, new drugs are becoming increasingly complex, specific and potent. Biological messenger molecules and cell surface receptors, i.e., the targets that medicinal chemists try to affect, are asymmetric (chiral). Thus, many drugs are three-dimensional "chiral" molecules with several stereoisomers possessing significant pharmacodynamic, pharmacokinetic and/or toxicological differences.

Chirality refers to the fact that two molecules may have the same composition, but are mirror images of each other. A typical example of a chiral system are the right and left hands. Both hands have the same number and types of fingers (composition), but clearly they are not identical. Well-known examples of chiral drugs include ibuprofen in which one isomer is biologically inert and the other is an analgesic. Another example is the controversial drug Thalidomid®, which contains a racemic mixture that was given to pregnant women for morning sickness and nausea during the first and second trimesters. Only too late was it discovered, that the (R)-enantiomer was tertragenic and blocked the cells of growing limbs in fetuses, thus causing children to be born with very short arms and legs. For this and other reasons, an increased effort is being made to administer drugs in their enantiopure form.

Our research focuses on the development of chiral catalysts, i.e., catalysts that selectively produce only the desired stereo-isomer. Most chiral catalysts developed to date are organometallic soluble (homogenous) complexes which, unfortunately, cannot be removed from the reaction mixture easily. Thus, another aim of our work is to immobilize these complexes on solid particles, which can be removed from the reaction mixture by filtration and can be reused.