A large percentage of organic compounds with biological activity contain a double bond. It is either (*E*)-configured, when the substituents are on the opposite sides of the bond, or (*Z*)-configured, when they are on one side. The configuration of the double bond usually does not affect the chemical properties of the compound, but in the case of molecules with biological activity, such as pharmaceuticals or pheromones, it can have a key effect on biological properties.

A number of methods can be used for the synthesis of compounds containing double bonds, and one of the most popular is the catalytic olefin metathesis reaction. It is widely known and used by the scientific community, and the researchers who explained its mechanism and developed the first active catalysts received the Nobel Prize in 2005. Unfortunately, most of the currently known catalysts allow obtaining products as a mixture of both isomers which separation can be quite difficult and sometimes even impossible. In addition, when it is important to obtain only the product with either (*E*)- or (*Z*)-configuration—and as we know that in the reaction a mixture of products is formed—the yield of the process decreases significantly, making it less profitable. Fortunately, new catalytic systems have recently been developed that allow the selective preparation of only one isomer. Unfortunately, due to their limited stability, they can be used only under anhydrous and anaerobic conditions at near physiological temperatures, and in addition, they are not always active enough to be used in reactions with less reactive substrates.

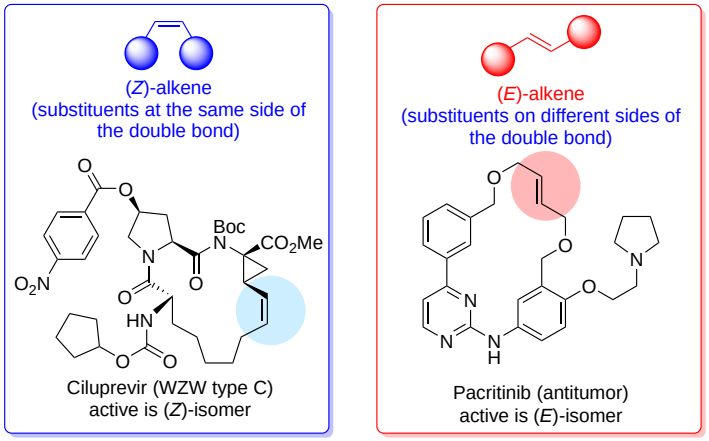

Figure 1: Possible arrangement of substituents around a double bond and examples of compounds with biological activity in which only one isomer exhibits the desired properties.

Within the framework of the current project, I will address this problem by modifying the structure of the catalyst, which will significantly improve its stability towards air and moisture, and the possibility of application of the obtained complexes at elevated temperatures, even up to 100 °C, will allow the use of substrates that do not react under milder conditions. The developed solution will allow wider access to numerous compounds with biological activity, in which the double bond configuration is crucial and the incorrect arrangement of substituents in the space can not only decrease the activity of an active substance but can also significantly change its biological properties. This is particularly risky in the case of pharmaceutical products used to treat a variety of disorders, as well as pheromones, as only one isomer is recognized by insects.