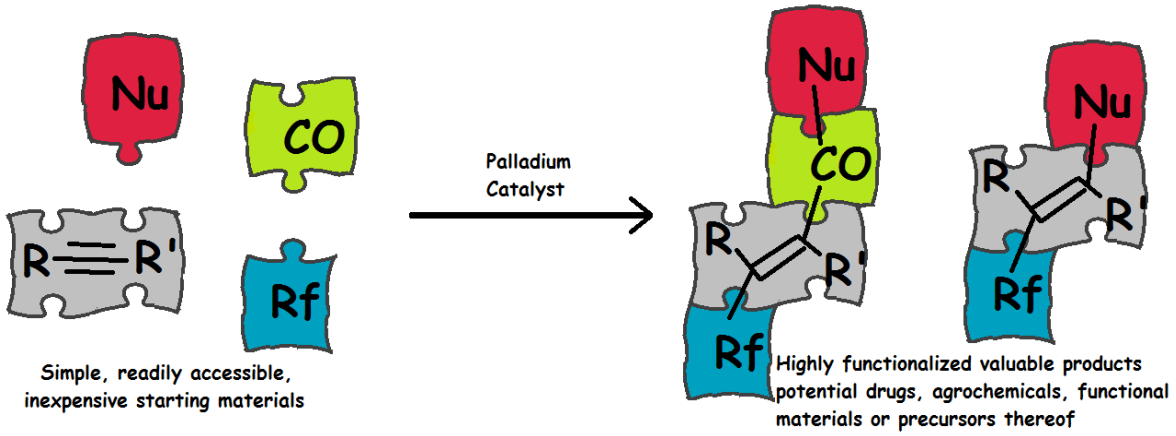
Description for the general public

The possibility of performing multiple chemical transformations in an efficient and selective way with all ingredients, reagents, catalysts and intermediates present at the same time in one pot (as nature does) is the Holy Grail of synthetic organic chemistry. The main objective of this project is to approach this ultimate, probably unreachable, goal in the processes of the incorporation of perfluorinated organic groups (groups with all hydrogen atoms switched to fluorine, blue puzzles) into target molecules possessing a C-C double bond (called olefins or alkenes). Modular character of the projected protocols enables the assembly of simple, inexpensive and readily available starting materials (colorful puzzles on the left) into highly functionalized compounds (structures on the right) of high importance to various branches of sciences, including medicinal chemistry (as a potential drug candidates or precursors thereof). In particular the possibility, of incorporation of carbon monoxide (green), a toxic gas formed in broken stoves and furnaces, but also used in many industrial processes, seems especially attractive.



Incorporation of fluorine atoms into the structure of organic molecules exerts a remarkable effect on their chemical, physical, and biological properties. It is reflected in the many varied application of fluorinated organic compounds in medicinal chemistry (>20% of drugs, including top sellers), agrochemistry (>30% of crop protection chemicals) material science and other branches of science. Unfortunately, the synthesis of fluorinated organic compounds is extremely challenging and despite significant progress in some areas of the field, others remain severely underdeveloped or virtually unexplored. The development of the projected efficient multicomponent methodologies would deliver new powerful tools for the synthesis of a broad range of variously functionalized perfluorolkylated olefins. Deep understanding of the reaction mechanisms would provide a solid foundation for the extension of the developed methodologies and applications in various, even unforeseen, directions. The availability of a reliable toolbox of synthetic procedures is expected to trigger broad-range research on the application of these classes of compounds in various branches of science in both academia and industry, including medicinal chemistry and smart material sciences.