One of the essential chemistry tasks is the development of chemical processes allowing to obtain new chemical compounds with the required properties. This goal can usually be achieved in several ways, but economics dictates that you look for the cheapest path. More and more demands are currently placed on the impact of such a process on the natural environment. Therefore, chemists are still looking for alternative methods, also for already developed chemical technologies, which would be cheaper and more environmentally friendly. One way to do this is to understand the relationship between chemical molecules' structure and the mechanisms of the chemical reactions in which they are involved.

In this project, we propose to develop a method that can provide us with important information about the dynamics of individual chemical molecules. Currently, the sources of such information are, among others, vibrational spectroscopy techniques such as the Raman scattering technique. The bands' positions in the Raman scattering spectra and their intensities provide information about the structure of the molecule. When the structure of a molecule changes, this is directly reflected in its Raman scattering spectrum as the bands' intensity and position change. By measuring such spectra frequently and observing how they change, we can conclude how chemical reactions proceed and how molecules interact with the environment.

Currently, the technique of such measurements of Raman spectra changes over time is applied to relatively large amounts of substances containing many molecules. Because in such a large group, each molecule behaves slightly differently, the spectra obtained in this way only show the image that is the result of averaging. Studying each molecule individually, we can get more details. The methodology proposed here is likely to provide information about changes in a single molecule structure over time. In this way, it will be possible to study chemical reactions' mechanisms in greater detail and then to optimize them.