The aim of the project is to study the mechanism of interactions between ozone and UV radiation with starches of different botanical origin (maize and potato) with different content of amylose and amylopectin. Ozone is a very active oxidizer and belongs to the group of reactive oxygen species (ROS). UV light, in the presence of oxygen and water molecules also generates reactive oxygen radicals. Therefore, their interaction with starch will lead to the oxidation of starch, probably more effectively then in case of other oxidizing agents (eg. NaClO, $H_2O_2$, $NaIO_3$). The oxidation of starch results in formation of carbonyl and carboxyl groups in its structure and is accompanied by simultaneous depolymerization of starch chains. The exact run of the process has not been described yet, however, it is assumed that breaking the glycosidic bonds are the first stages of the process. Reactive oxygen species are capable of detachment of hydrogen atoms from the carbon atoms in starch molecules and therefore, as it was shown in preliminary works, the carboncentered radicals, located on carbon atoms of the glucose molecules building starch chains, will be created. Determination of the structures of these radicals and kinetics of their creation may be helpful in explanation of the processes occurring during the oxidation of starch. The relatively high energy of UV radiation can cause damage to the structure of starch, and thereby facilitate penetration of the ROS molecules inside the starch granules, leading to oxidation.

The modern analytical methods will be applied to investigate the subtle changes in the structure of the starch occurring during its modifications. The most important method will be electron paramagnetic resonance (EPR) spectroscopy, which allows monitoring of the formation of radicals in the starch material. X-ray diffraction (XRD) and scanning electron microscopy (SEM) will allow observation of changes in the internal and external structure of the starch granules. Infrared Spectroscopy Fourier Transform (FTIR) will be used to determine the degree of oxidation of the starch, whereas gel permeation chromatography (GPC) and differential scanning calorimetry (DSC) together with other techniques will be applied to estimate the molecular weight and the functional properties of the starch.

Results of this study should be an important contribution to the understanding, on the molecular level, of the processes occurring in starch upon ozone or UV irradiation and the mechanism of these processes. In the long run the results may be used to develop methods for the production of oxidized starch, based on clean technologies, cost-effective and not harmful to the environment, because ozone and UV radiation, unlike the commonly used oxidants, do not generate during the processing any harmful by-products.