The use of various sources of plant biomass, such as waste from the wood industry or agriculture, is one of the alternatives to fossil fuels leading to a gradual reduction in the consumption of the latter. According to the current knowledge, the effective use of plant biomass in bioconversion processes is mainly dependent on the effective pretreatment of lignocellulosic biomass, which reduces cellulose crystallinity, partially degrades hemicellulose and removes lignin. One of the directions of development of plant biomass pretreatment strategies is the search for new methods, which most often combine physical and chemical techniques. However, the development of a new method for the preparation of lignocellulosic biomass requires basic research to learn the mechanisms of the impact of individual techniques on the structure of lignocellulose and effectiveness of its subsequent hydrolysis. Our previous research has shown the effectiveness of microwave radiation and surface tension lowering compounds combined with acid catalysis in the decomposition of waste plant biomass. Hydrotropes, i.e. substances lowering the surface tension of a solution, increase the solubility of hydrophobic substances (such as lignins) in aqueous solutions and thus allow their extraction. When hydrotropic extraction is carried out at elevated pressure and temperature, which can be achieved using microwave radiation, the extraction process intensifies. In addition, microwaves also cause changes in the cellulose structure. The hydrogen bonds are broken by electromagnetic radiation and dipole movement. The combined use of hydrotropes and microwaves should therefore intensify the process of lignin extraction from plant biomass and contribute to changes in the structure of polysaccharides, which may have a direct impact on the biomass susceptibility to decomposition. The project aims to explore the effects of microwave hydrotropic treatment with sodium cumene sulfonate on the structure of lignocellulose in hardwood, softwood and non-wood plant biomass. The combined use of microwave radiation and sodium cumene sulfonate for pretreatment of various types of biomass has not yet been studied and reported in the scientific literature. To our knowledge, there is no information on how microwave hydrotropic treatment changes the structure of lignocellulose (cellulose crystallinity, the ratio of individual functional groups) and whether such treatment modifies the susceptibility of structural polysaccharides to enzymatic hydrolysis. There is also no information whether the hydrotropic microwave treatment causes the formation of toxic substances such as 5-hydroxymethylfurfural, furfural and phenolic compounds that may limit the metabolic activity of microorganisms during bioconversion or biotransformation processes. The result of the project will be the determination of specific changes in the structure of lignocellulose caused by the proposed pretreatment method, develop a new method for the effective preparation of biomass for enzymatic hydrolysis, and assess the possibilities of its use for microbiological biosynthesis on the example of ethanol fermentation using *Saccharomyces cerevisiae*. The research will be carried out in a modern biotechnology laboratory equipped with instruments for comprehensive analysis of lignocellulosic biomass degradation under controlled conditions, as well as analytical devices necessary for the assessment of the analyzed processes. The following analytical and research techniques will be used: microwave assisted extraction, HPLC-DAD-RID (liquid chromatography), FT-IR (infrared spectroscopy), XRD (X-ray refraction), 1H NMR (nuclear magnetic resonance), SEM (scanning electron microscope), and microbiological conversion of hydrolysates to ethanol. The project mainly focuses on the impact of microwave hydrotropic treatment on the composition and molecular structure of lignocellulose. However, the subject of the project is not only important in the context of basic research. The development of an effective pretreatment method that would enhance the hydrolysis of structural carbohydrates to fermentable sugars while maintaining a low concentration of fermentation inhibitors is a key step in the utilization of hydrolysates for microbial synthesis of target chemicals such as cellulosic ethanol. The project addresses very important and timely issues due to the increasing use of waste lignocellulosic biomass in fermentation processes. The agri-food industry is currently generating huge amounts of waste, including those containing lignocelluloses. Managing this waste is a serious problem. The use of waste in biotechnological processes as a source of carbon is an alternative way of utilization compared to the thermal conversion techniques used so far. In the long term, project results can help solve technological problems associated with the efficient production of cellulosic ethanol. An important component of the so-called small technological loop is application (industrial) analysis supplemented with necessary basic research, which will be the subject of this project.