

“Preparation of polymethacrylate nanoparticles synthesized with fluorescent initiators for applications in cell biology” – description for general public

Intercellular communication plays a key role in the development of multicellular organisms, and ensures proper response to external stimuli. In the case of plants individual cells are interconnected by channels called plasmodesmata and together form a unit called a symplast. It is a convenient, fast and precise way of exchange of information between cells. It is now known that proteins, nucleic acids (RNA), or nutrients can be conveyed via plasmodesmata. All of this makes symplasmic communication one of the key mechanisms that control life processes of plants. Current knowledge on the subject is getting fuller, but still lacks good understanding of the construction of plasmodesmata and complex mechanisms involved in the regulation of its selective bandwidth. Further research require full arsenal of molecular methods and physiological and biochemical analysis. Finding of new opportunities for symplasmic communication research still becomes a necessity.

This project involves the synthesis of new fluorescent polymeric nanoparticles, which have potential application in the study of symplasmic communication. In the first stage of the study initiators based on classical fluorescent dyes used in studies on plants, such as fluorescein or pyranine will be synthesized. Then, the obtained compounds will be used in controlled atom transfer radical polymerization (ATRP) to obtain a well-defined, water-soluble macromolecules, which will serve as fluorescent nanoparticles. The resulting products will be characterized in a further step by such techniques as nuclear magnetic resonance (NMR), infrared spectroscopy (IR) and gel permeation chromatography (GPC). They will be also examined for features affecting the utility for biological tests such as the hydrodynamic diameter or critical micelle concentration. The last stage of the research will be attempt to use selected nanoparticles with the best parameters for symplasmic communication studies.