DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Recent trends in the synthesis of biochemically active substances turned to nature, where the wide range of sustainable chemical substances is produced without human intervention. Microalgae relying on photosynthesis process constitute the excellent natural source of oxygen and sustainable value-added metabolites, like pharmaceuticals, carotenoids, fatty acids or sterols. Due to this phenomena algae may be valuable in many industrial and/or medical applications, however after their effective immobilization. According to the literature, over the years, only few articles relating to design and synthesis of hybrid microbeads with capsulated microalgae have been conducted and published. Therefore, there is need to increase our knowledge about microalgae encapsulation process.

The research presented in this project encompass the synthesis and characterization of hybrid biocompatible polyelectrolyte microcapsules/microspheres to entrap the unicellular algae. The novelty of this studies is adequate comparison of three different encapsulation techniques, namely, biocompatible coacervation, membrane emulsification (ME) and layer-by-layer technique (LbL), which have been selected as potential, highly efficient processes for microbial capture. Several essential parameters and factors for the synthesis of hybrid polyelectrolyte microcapsules/microspheres *via* these three methods are still unknown and fundamental processes analysis is necessary.

An important part of this study will be a complete mathematical description of both the microalgae encapsulation process and mass transport of the carbon dioxide through bio-hybrid matrix, which has not been sufficiently developed so far. Therefore, proposed development of the experimentally verified mathematical model using diffusional mass transport modeling may affect the expansion of the basic knowledge from the scope of the given subject. Additionally, the effect of encapsulation process parameters (ME, coacervation technologies) on stability and photosynthetic activity of algae filled microcapsules will be evaluated with the application of response surface methodology (RSM).