

Air appearing microplastic particles, so-called airborne microplastic, are mainly generated by the use and wear of clothes, abrasion of car tyres, industrial emissions, erosion of paints and coatings, as well as urban and household dust. The risks posed by the presence of airborne plastic microparticles, as well as their effect on human, animal and ecosystem health, are insufficiently understood and described issues of concern to date. Airborne microplastics can pose a serious threat to human health, as microplastic particles can enter the lungs and further into the bloodstream through inhalation, causing lung disease and inflammation. Airborne plastic microparticles can also carry other pollutants such as heavy metals, harmful chemicals or pathogenic microorganisms. In addition, inhalation of contaminated plastic microparticles can aid in the transport of harmful substances into living organisms, posing a risk of endocrine disruption, mutagenicity and other toxic effects. With the increasing concern about the presence of airborne microplastic particles as a new type of airborne pollutant, it is important to undertake extensive and advanced research into the type, occurrence, concentration, distribution and properties of microplastics in air.

Therefore, the main objective of the presented project is the fabrication and characterisation of nanofibrous electrospun membranes, derived from water-soluble polymers and biopolymers, which will find application for the filtration of air pollutants, with a particular focus on airborne microplastic particles. In order to achieve high filtration efficiency of airborne microplastics and to fine-tune the physico-chemical and morphological properties of the membranes, the electrospinning process will be optimised and the membranes will be thoroughly characterised. **The membranes produced will then be used as filters in an apparatus designed and built as part of the project to measure the amount of airborne microplastic pollution and thus determine the degree of air pollution. As a result of the project, new air sampling methods will be developed for the analysis of airborne microplastics, as well as the characterisation of the samples collected including quantitative and qualitative testing of microplastics.** The ability of airborne microplastic particles to adsorb other pollutants will also be investigated to better understand the impact of airborne microplastic particles on overall air pollution. The international collaboration carried out under the project will not only allow the analysis of air composition in different European countries, but will also enable the development of sampling protocols and storage methods. An important stage of the work will be to assess the impact of the amount of microplastic pollution on the human respiratory system. This work will be carried out using advanced computer modelling techniques as well as in vitro experiments. **In order to make the project holistic, in its final stage, after a thorough characterisation of the pollutants and based on the resulting membranes and immobilised enzymes, novel biocatalytic systems will be produced and tested for efficiency in the removal of microplastic from air, which also underlines the considerable novelty of the submitted project.**

The interdisciplinary project presented encompasses material science, chemical engineering and technology, environmental protection, and analytical chemistry. The results obtained will not only confirm the research hypotheses, but also enable the development of new methods for the synthesis of electrospun membranes and procedures for the analysis of airborne microplastic pollutants. The results obtained will significantly contribute to the existing knowledge in the design and formation of nanofibrous membranes with controlled physicochemical properties and desired morphology. The key elements of the presented project are the fabrication of nanofibrous membranes and the subsequent use of the prepared membranes for filtration and removal of airborne microplastic particles and their systematic analysis. The development of technological solutions to capture microplastic particles from the air and degrade them on electrospun biomembranes can significantly contribute to improving air quality.