Contamination of water reservoirs with various chemicals is especially dangerous in respect to the growing acute shortage of drinking water. According to the AQUASTAT, Poland belongs to the group of five European countries with the lowest level of surface and ground water. Therefore, nowadays, there is extremely urgent need to develop the water-saving systems, where waste-water treatment and efficient methods of detection of water pollution are of crucial importance. Amounts of water used in industrial processes and for household's demands are enormous and so are amounts of produced waste waters, where surface-active substances (SAS) are the main component. The SAS can be recognized as one of the most wide-spread organic contaminations – they are used at an enormous scale in many different fields as detergency, fibers, food, polymers, pharmaceuticals, mineral processing and paper industries.

SAS belong to the largest groups of chemicals having great environmental impact. The most dangerous feature of SAS is their ability to concentrate at the water surface, where they form a kind of skin. This important SAS feature, very useful from the practical point of view in many industrial processes and everyday human life, makes them very dangerous for environment. Formation of SAS layer at the water surface can significantly affect an air exchange, oxygen contents and life in waters. Even small amounts of the SAS are toxic for aquatic flora and fauna, because can be accumulated in the living organisms. Furthermore, the SAS molecules are toxic for human due to their ability of incorporation in the cell membranes.

We all should be aware that the SAS are hazardous for the natural environment and try to limit their enormous amounts used every day for cleaning and washing. Besides, environmental concentration of the SAS should be monitored and kept at possibly low levels, what is restricted by special law regulations. Alignments with these regulations required constant and routine monitoring of the SAS presence in waters. The methods which are used routinely as standard procedures for monitoring of various groups of the SAS in waters are rather time-consuming, required special and often sophisticated laboratory equipment as well as expensive and sometimes toxic reagents. The project is aimed to develop the fundamentals of alternative, new simple physicochemical method for quantitative characterization the SAS presence in natural and industrial waters based on monitoring of velocities of small air bubbles released one by one in the water sample.

Velocity of a rising bubble of a given size is the highest in pure water and gradually decreases with increasing the SAS concentration. This is due to the fact that SAS molecule can attach to the bubble surface. Lowering of the bubble velocity can be noticed even for extremely low SAS concentrations, in the situation, when one SAS molecule is surrounded by million water molecules. In addition, the bubble velocity can be altered by the SAS presence in a characteristic manner, resulting in SAS concentration dependent variations in the bubble local velocities. This feature makes the rising bubble surface a great tool and very sensitive sensor for assessment of the water quality. We would like to use this useful feature to develop new, simple economic and fast methodology of the water quality assessment, which can be used as an alternative for conventional, "classical" methods used routinely in various facilities dealing with water quality monitoring. As was mentioned, such method has to be able to capture local bubble velocity variations rather than bubble average velocity - characteristic pattern of the bubble local velocity variations can be used a calibration tool needed for precise determination of the SAS presence not only in qualitative but also quantitative way. We will be able to not only to proof that the SAS molecules are indeed present in water but also answer the question how many of them swim in the sample.

To achieve this goal, we plan to develop new protocols of the bubble velocity measurements, which are alternative to the existing ones. The method of the bubble generation in a water sample, velocity determination and quantitative analysis will be fully automatized, to be suitable for use as a routine way of the water quality monitoring in environmental water samples as well as during many industrial processes (on-line measurements), also in the case, when the liquid sample is non-transparent, cloudy or turbid.