ABSTRACT

Laser desorption/ionization mass spectrometry is one of the fastest developing methods of instrumental analysis nowadays. Its popularity is influenced by the ease of sample preparation and the speed of measurements, which allows you to measure a large number of samples in a relatively short time. The development of this technique has contributed to significant advances in the fields of proteomics, lipidomics and metabolomics.

The last dozen or so years have significantly influenced the progress in the synthesis of nanostructures, which began to be used as a substitute for organic matrices in laser mass spectrometry. The characteristic properties of nanoparticles allowed for greater sensitivity of measurements, while maintaining very high repeatability, which popularized their use in this family of analytical methods. In addition, lowering the intensity of the chemical background in the spectra allowed for the study of more complex samples such as biological objects. Thanks to this, it became possible to track the distribution and concentration of metabolites in tissues, which in turn contributes to a better understanding of the biochemistry of living organisms.

The prepared doctoral dissertation consists of a series of ten publications in which original research using metallic nanoparticles (gold and silver) replacing typical MALDI organic matrices for laser mass spectrometry was presented.

In the first part of the work, a short theoretical introduction was prepared describing the current state of knowledge in the field of the use of nanostructures in laser mass spectrometry and mechanisms of desorption and ionization, with particular emphasis on laser ablation.

In the following chapters, subsequent publications included in the series are discussed, together with the justification for combining them into one series. They present the research that has been carried out and concisely discuss the results obtained during the analyses.