

A popular science summary of the project

In multi-elemental chemical analysis using atomic spectrometry methods, inductively coupled plasma (ICP) bulky spectrometers with optical emission spectrometry (OES) detector are commonly used. These devices enable simultaneous analysis of many elements with very low detection limits (LOD). However, the main disadvantages are the high price and significant operating costs resulting from high consumption of inert gas and electrical power. For this reason, alternative plasma sources of excitation for OES have been explored for years, which would allow to achieve analytical parameters close to ICP, and at the same time will be characterized by smaller sizes, cheaper design and lower operating costs. A very promising group of alternative plasma excitation sources are electrical discharges generated in contact with the liquid. Of this group, glow discharge generated at atmospheric pressure (APGD) in contact with a liquid cathode flow (FLC) deserves special attention, where the analyte solution flows out of the quartz tube below the solid metal electrode.

In this project I going to build and optimise for the first time a new microplasma system in which solution will be flowing from the top creating self-renewable hanging drop cathode (HDC), which would be completely evaporated by discharge. The use of that construction will significantly reduce the amount of sample necessary to carry out the analysis and thus reduce the amount of water introduced into the microplasma zone, which will improve LODs and stability of discharge. It is also expected that the application of total evaporation of sample would relatively increase exposition of analysed elements to conditions occurring in plasma, which would cause enhancement of emission of elements and its LODs.

During the realization of this project a new HDC-APGD-OES microplasma system will be develop. The optimization of its construction and working parameters will be carried out. The spectroscopic parameters and analytical performance will be examined. The analysis of certify reference materials (CRM) and environmental samples would be done to confirm the applicability of HDC-APGD-OES system in analytical chemistry.