Abstract

In this Ph.D. thesis possibilities of using our proposed potential programs for a multiple-pulse amperometry and a fast scan differential pulse voltammetry in combination with flow systems are presented. The development of new sensitive amperometric and voltammetric methods for the determination of oxidisable biologically active organic compounds is another aim of this work.

In the first part of the work, the flow injection system and multiple-pulse amperometric detection were employed to develop and optimize a simple, low-cost, and rapid method for the simultaneous determination of natural and synthetic antioxidants. This technique involves the application of an appropriate potential waveform consisting of a suitable sequence of pulses on a single working electrode, thus allowing distinguish the analytes in a mixture with no need of separation. Conditions for the determination of antioxidants and modelling of the potential program were tested and studied, respectively.

Second part of the work describes and characterizes the application of the fast scan differential pulse voltammetry (FSDPV) in combination with the flow systems. FSDPV is the electroanalytical technique that use high scan rate to record voltammograms within several milliseconds and ensures high temporal resolution. This technique was characterized using the hydroquinone/quinone redox system.

During the characterization of the techniques in combination with the flow systems, the separability, the repeatability, and the concentration characteristics for the determination of commonly known antioxidants in standard solutions were performed. Successful testing has proved that these techniques have a good potential to be applied in routine analysis in substitution of expensive separation systems. Finally, the optimized procedures were applied for practical purposes to determine antioxidants contained in real matrices by applying a simple extraction procedure. The advantages and possibilities of the techniques are discussed, and the selectivity and sensitivity of the detectors are compared with other commonly used detection techniques, such as HPLC with DAD, ED or MS detection.