Summary

In the last two decades, different acoustic technologies for biosensors applications have emerged as promising alternatives to other better established detection technologies – acoustic or optic ones- such as traditional Quartz Crystal Microbalance (QCM) and Surface Plasmon Resonance (SPR). The alternative acoustic technologies for in liquid measurements are reviewed in this manuscript. Surface Acoustic Wave (SAW) Love Mode or Love Wave (LW) sensors are determined to be the most promising and viable option to work with for achieving the main aim of this Thesis. Such aim is the development of a LW immunosensor for its comparison with the same application based on High Fundamental Frequency-QCM (HFF-QCM) sensors and under the same conditions. Consequently, the state-of-the-art of LW devices for biosensing is provided and a discussion about the current trends and future challenges of these sensors is presented. In order to start working with suitable LW devices, up-to-date information regarding the design aspects, operation principles and modeling of such devices is gathered. Some design aspects are explored and tested to establish the design of the final LW device. Different simulations for modeling the chosen device behavior are carried out before its fabrication. Later, the device fabrication is described. Next, to start working with the fabricated device in liquid media, a flow cell is designed and implemented. In addition, an electronic characterization system, previously validated for QCM sensors, is adapted and tested for the fabricated LW device. As results, the adapted electronic characterization system is validated for LW devices mounted in the fabricated flow cell and, finally, a LW-based immunosensor for the determination of carbaryl pesticide was developed and compared with other immunosensor technologies.

Keywords: Surface Acoustic Wave (SAW) devices, Love Wave/Mode sensor, biosensor, immunosensor.