

ABSTRACT

The corrosion of the rebars is one of the principal causes that affect the durability and longevity of structures. The carbonation of concrete and the activity of aggressive ions, mainly chloride, are among the processes that can cause a major risk to the corrosion of rebars. Control and monitoring by way of nondestructive techniques is fundamental in order to obtain information of factors that can expedite the process of corrosion.

This thesis presents the results of various studies. It begins by detailing the process of fabricating, characterizing and evaluating the different types of electrochemical sensors that control the access of chloride ions and the pH measures of concrete. The sensors are made by hybrid microelectronic technology, specifically thick film technology.

The research continues by proposing a new, indirect model by which to measure the resistance of concrete that would facilitate the evaluation of the probability of corrosion in the rebars. Due to previous work where conductivity had been studied in an electrolytic cell an alternative methodology to the direct measure and the four-point method was proposed which would facilitate the ability to monitor the evaluation of the resistance of hardened concrete.

Finally, multivariate methodologies (Principal Component Analysis) in conjunction with traditional electrochemical techniques are applied to obtain information of the agent that causes the corrosion; hence this has the potential to be an effective tool for the comprehensive understanding of the metallic being studied.