

## Guest Editorial

## Advances in corrosion control

Corrosion of reinforcing steel is one of the major causes of deterioration in reinforced concrete structures. Corrosion is usually a slow process that develops at the reinforcing steel level, far from the naked eye assessment. Although slow, it is very dangerous and reduces the lifetime of the structure, causes strong economic impact and may have severe safety implications. Thus, Corrosion control plays an important role in the durability of reinforced concrete structures. The quality, safety and lifetime of reinforced concrete structures can be strongly improved if the correct measures concerning corrosion control are taken.

Corrosion control starts with correct project design and good practices and quality of construction and needs the implementation of effective anti-corrosion measures.

Corrosion is an electrochemical process that needs the presence of oxygen, water and aggressive agents, such as chloride ions. Thus, monitoring of these species plays an important role in corrosion control. The development of sensors for in situ monitoring of these species is thus a fundamental step for effective corrosion control. The determination of the content of aggressive species inside concrete such as the content of chlorides is essential to establish the structure lifetime and to avoid corrosion onset.

Monitoring of the rebars through the use of electrochemical techniques is another approach for corrosion control. The assessment of the electrochemical behaviour of the rebars provides information on the evolution of the corrosion reactions and helps to define and to establish preventive measures. Although most of the electrochemical techniques are well established, their use in reinforced concrete structures is still limited. The reasons for this are several and include the particular nature of concrete, the high ohmic drop and the large dimensions of the structures. The application of electrochemical techniques such as linear polarization or impedance spectroscopy raises several doubts and questions that need further and continuous investigation.

The modification of the rebars surface in order to improve their resistance against corrosion onset is another important step for corrosion control. The use of stainless steel rebars or the use of galvanised rebars has been growing during the last years. These materials present improved lifetime, when compared to the traditional steel rebars, but they are not free of

corrosion problems. Stainless steel can suffer pitting corrosion in the presence of chloride ions and care must be taken when choosing the stainless steel rebars grades. Galvanised rebars are often used in concrete construction, but they are very sensitive to early corrosion reactions. Thus, the understanding of the electrochemical behaviour of these alternative materials is a key factor to reduced corrosion-induced problems during the lifetime of the structure.

Strong efforts have been put in the search of sensors for continuous monitoring and determination of the amount of aggressive species inside concrete, data for modelling, development of procedures for the use of electrochemical techniques and choice of alternative reinforcing materials to control corrosion on reinforced concrete structures. This special issue, devoted to corrosion control, intends to be a humble contribution to these efforts. All the authors intend to contribute for the dissemination of new knowledge that can be used to develop and to establish scientific based practices for corrosion control in reinforced concrete structures.

I am thankful to Prof. R.N. Swamy and to the Journal Cement and Concrete Composites for providing me the opportunity to prepare this issue devoted to such an important theme. The papers published in this issue were presented at the European Corrosion Congress (Eurocorr 2005) hold in Lisbon, September 2005. Myself and all the contributors acknowledge the European Federation of Corrosion (EFC).

I would like to express my deep appreciation to all the authors for their contributions and the reviewers for their time and advices.

It is our objective to improve the actual knowledge and contribute for new developments on the filed of corrosion control in reinforced concrete structures.

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