



## **Work Theme A: Sustainable Infrastructure Development**

### **A2: Localized corrosion in galvanized steel reinforcements in reinforced concrete structures**

#### **Project Title:**

#### **a) “Corrosion Mechanisms and Prevention of High Performance Steel in Reinforced Concrete Structures”**

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#### **Project Outline:**

The sub-project will be conducted in the following four aspects:

##### **1. Corrosion mechanisms**

The corrosion mechanisms of high performance steel (galvanised, high strength, and stainless steel) in concrete structures exposed to chloride environment (marine environment) will be studied in this sub-project. Both microcell and macroscopic methods will be adopted to investigate the corrosion mechanisms, combined with electrochemical, physical and chemical knowledge.

##### **2. Corrosion prevention of high performance steel**

The effect of different cement binders, organic corrosion inhibitors will be studied based on a series of experimental tests. The effect of concrete coatings on the corrosion of high performance steel in concrete will also be studied.

##### **3. Mechanical and bond behaviour of corroded high performance steel**

The influence of corrosion on the mechanical properties and bond behaviour of the high performance steel will be investigated in this sub-project.

The residual morphological appearance of the high performance steel induced by the chloride corrosion will be analysed together with the residual mechanical performance of the steel. The residual mechanical properties will be identified carefully with the corrosion levels, corrosion patterns and corrosion distribution.

Pull-out test and physical-chemical examination will also be conducted to the corroded samples in order to check the influence of corrosion on the bond behaviour.

#### 4. Corrosion monitoring

The corrosion propagation of high performance steel will be monitored continually. The electrochemical polarization of the high performance steel in the concrete will be checked during different corrosion processes.

All the four aspects are firmly about the corrosion of high performance steel in concrete structures, which is also considered as one of the most important fields for the durability of the high performance steel. With the contribution of this sub-project, the application of high performance steel will be improved significantly, and will be of great help for the CNERC.

The aim of this sub-project is to investigate the corrosion mechanisms and prevention of the high performance steel in concrete structures in marine environment. The sub-project has the following specific objectives:

1. To investigate the corrosion mechanisms of the high performance steel embedded in concrete, the electrochemical propagation of the corrosion process in both the initiation period and the deteriorating period, including the corrosion art, corrosion patterns and the corrosion distribution.
2. To identify the effects of different cement binders, organic corrosion inhibitors and concrete coating on the corrosion of high performance steel in concrete.
3. To make clear the influence of corrosion on the mechanical properties of the residual reinforcement, the corrosion art on the mechanical performance of the steel; to identify  
  
the effect of corrosion on the bond of the high performance steel in both microcell way and mechanical way.
4. To monitor the corrosion process so as to identify the corrosion propagation of the high performance steel in the concrete.