Corrosion Propagation Behavior of low–Cr steel Rebars in Simulated Concrete Environments

Ming Liu^{1,2,*}, Xuequn Cheng^{3,*}, Xiaogang Li^{3,4}

¹ MOE Key Laboratory for Multifunctional Materials and Structures, Xi'an Jiaotong University, Xi'an 710049, PR China

² State Key Laboratory for Mechanical Structure Strength and Vibration, Xi'an Jiaotong University, Xi'an 710049, PR China

³ Corrosion and Protection Center, University of Science and Technology Beijing, Beijing 100083, PR China

⁴ Ningbo Institute of Material Technology & Engineering, Chinese Academy of Sciences, Ningbo 315201, Zhejiang, PR China

*E-mail: liuming0313@xjtu.edu.cn (Ming Liu), chengxuequn@ustb.edu.cn (Xuequn Cheng)

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Corrosion propagation behavior of HRB400 carbon steel and three low–Cr steel rebars in alkaline solution simulating concrete pore solution were studied using potentiostatic /galvanostatic polarization, and wire beam electrode (WBE) measurement. Results show that the radial corrosion process of the steels are controlled by ohm resistance and the propagation time can be calculated by $r = kt^{1/3}$. The corrosion propagation process of the steels are inhibited when the electrode potential is below $-0.6V$ (vs. SCE). The corrosion areas of HRB400 steel is widespread and Cr–modified steels are relatively limited, Cr–modified steels have higher pitting corrosion factors. With the increasing of Cr content, the pitting corrosion factor of the steel increases, and the corresponding localized corrosion anode length decreases. 5Cr steel has the longest corrosion propagation time which is about 16.7 years, 3Cr steel is 10.3 years, 1.5Cr steel is 5.4 years, and HRB400 steel is only 3.6 years. Using Cr–modified steels can prolong the corrosion propagation period of concrete structures, and 5Cr steel shows the best.

Keywords: low–Cr steel; Polarization; WBE; Pitting; Service life

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