

报告人：汪裕洲 博士

报告人单位：香港理工大学



报告题目：**Corrosion resistance of weathering steel with RE (rare earth) addition in marine environment** (稀土耐候钢在海洋环境下的腐蚀行为研究)

时间：2024 年 10 月 12 日 (星期六) 10:00-11:00

地点：大结构会议室 209

线上链接：腾讯会议 678-238-216

欢迎参加!

#### 报告人简介

汪裕洲博士，于 2022 年在浙江大学取得工学博士学位，目前在香港理工大学建筑与环境学院土木工程系担任博士后研究员。汪裕洲博士主要致力于钢结构和钢筋混凝土结构中的钢材腐蚀问题的研究，主要研究方向包括：1) 先进耐候钢在海洋大气环境中的应用；2) 耐腐蚀钢筋-海水海砂混凝土体系腐蚀行为；3) 混凝土内的锈蚀产物反应-传输模型及其对混凝土锈裂的影响。

#### 报告摘要:

Weathering steel, developed in 1930s, was a low-alloyed steel with high cost-effectiveness and good corrosion resistance. However, conventional weathering steel cannot be applied to marine environment since the formation of protective rust layer on its surface is inhibited by the chloride ions. In this study, rare earth (RE) element was added to weathering steel to improve its corrosion resistance. Both the corrosion initiation and long-term corrosion performance in different chloride concentration were investigated by multifarious analytical technique, such as exposure test, electrochemical measurement, 3d laser scanning microscope, scanning electron microscope/energy dispersive spectroscopy (SEM/EDS) and Raman spectroscopy. Results show that although RE elements can refine grains and modify inclusions,

the corrosion initiation of weathering steel with RE addition cannot be inhibited since the dissolution of grains with higher corrosion activity contributes to most of the weight loss at this stage. Besides, the long-term corrosion performance of weathering steel with RE addition, which can be attributed to its rust layer with compact and dense structures. Considering that the corrosion initiation stage is such a short period compared to the steady-corrosion state during weathering steel's service life, it can be concluded that the RE addition can improve the corrosion resistance of weathering steel, especially in marine atmospheric environments.

耐候钢是一种 20 世纪 30 年代开发的，具有高性价比和较好耐蚀性的低合金钢。然而，由于表面保护性锈层的形成受到氯离子的阻碍，传统耐候钢不能被用于海洋环境。为了改善耐候钢的耐腐蚀性，本研究向耐候钢中加入了稀土元素。在不同氯浓度环境下，采用多种分析技术（暴露试验，电化学测试，三维激光扫描显微镜，扫描电镜/能谱，拉曼光谱）研究了钢材的腐蚀初始和长期腐蚀行为。结果表明，尽管稀土元素能够细化晶粒并改善夹杂物，但并不能遏制耐候钢腐蚀的发生，这是因为具有更高腐蚀活性的晶粒溶解是该阶段质量损失的主要来源。此外，稀土耐候钢表面能形成致密的锈层，使其具有更好的长期耐腐蚀性。考虑到相比于耐候钢服役寿命中的稳定腐蚀阶段，腐蚀初始阶段只占据极短的一段周期，故可以得到结论：向耐候钢内添加稀土元素整体上提高了其耐腐蚀性，尤其是在海洋大气环境中。

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**Biography**

Dr. Wang Yuzhou is a Postdoctoral Fellow in Civil Engineering at the University of the Hong Kong Polytechnic University (PolyU). He earned his PhD from the Zhejiang University (ZJU).

**Area of expertise**

Dr. Wang Yuzhou's research interests are centered around steel corrosion of both steel structures and reinforced concrete (RC) structures. His specific areas of focus include:

- 1) Application of advanced weathering steel in marine environment;
- 2) Durability of corrosion-resistance steel in seawater sea-sand concrete (SWSSC);
- 3) Corrosion products reactive-transport in concrete and its effects on corrosion-induced concrete cracking



### 个人信息

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