Corrosion behaviour of Q345 steel under salt spray environment

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Corrosion Behaviour of Q345 Steel under Salt Spray Environment: Corrosion is one of the most common but destructive hazards of steel structures in offshore construction and maintenance which can lead to accelerated failure of structural components. In this research, the corrosion behaviour of Q345 steel, which is widely used in civil engineering structures, is analyzed by both the salt spray accelerated test and the numerical simulation method. Among which, the atmospheric uniform corrosion is evaluated by the mass loss and the thickness loss of the specimens while the pitting corrosion is counted by the super-high magnification lens zoom 3D microscope. In terms of the numerical simulation, the atmospheric uniform corrosion is simulated based on the COMSOL software and the pitting corrosion is reproduced by the 3D cellular automata model. The results show that the COMSOL simulation well fit to the experimental data with the same corrosion environments. Thus, based on the numerical model, some parametric analyses are carried out to figure out the key factors to the corrosion rate. It is confirmed that among all of the relative parameters, the relative humidity and the chloride concentration dominate the corrosion rate obviously. For the pitting corrosion analysis, the Non-Homogeneous Poission Process (NHPP) and the unsteady logarithmic Gaussian distribution (ULGD) can properly describe the evolution process of the corrosion pits of Q345 steel according to the fitting results of test data. The 3D cellular automata model can better reflect the evolution randomness as well as the time-varied laws of the initiation and growth processes of corrosion pits. (This research is supported by National Natural Science Foundation of China, Contract No. 51878493)