Effect of The Distance Between Two Electric Couples on Their Corrosion

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Abstract In practical engineering, differently metallic pipes are inevitably connected, resulting in the occurrence of galvanic corrosion. Under this condition, there are many factors which have some influences on the galvanic corrosion between two different metal pipes, such as material, pipe length, and diameter etc,[1]. Recently, many of studies have mainly focused on the galvanic corrosion between two different metal pipes. It was found that the electrical current and potential difference between two different metal pipes exhibited an exponential decay trend rather than a linear distribution and showed a closed relation to the distance between two electric couples[2]. However, there are in practice many electric couples which are composed of differently metallic pipes within a piping system. To delve deeply into the impact of inter-couple distances on corrosion, in this study, the two-coupling system comprising the aerobronze-TA2-QD785 seawater pipes with 100mm diameter was established.

The effect of the distance between a two electric couples on the electrical current and potential distributions along the length direction was investigated using the Comsol software. When the diameter of pipe was determined, the minimum distances L1 and L2 for corrosion current attenuation of each couple were determined through theoretical calculations. Subsequently, the discussions were conducted on various scenarios regarding the length L of the intermediate section, including cases where L is smaller than the smaller of L1 and L2, between L1 and L2, greater than the larger of L1 and L2 but less than their sum, and greater than the sum of L1 and L2. It was found that there was obvious effect the distance on the electrical current and potential distributions between the two electric couples.

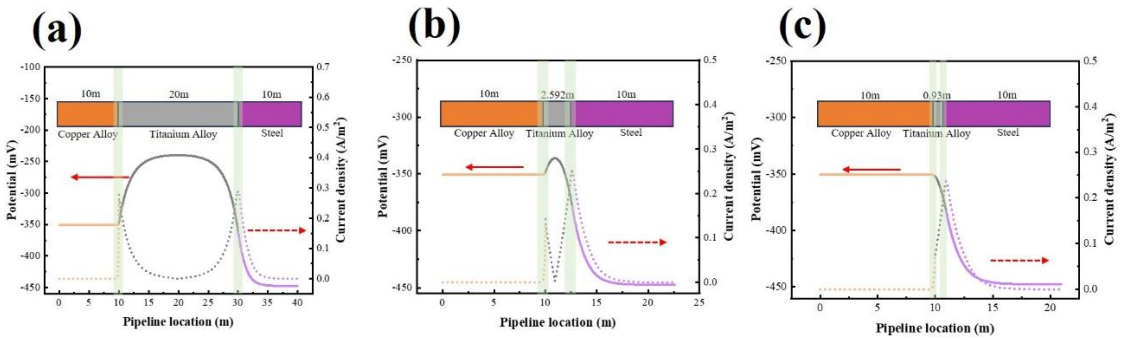

Fig.1 Potential and current distribution when pipe length is set to (a)10m-20m-10m (b)10m-2.592m-10m (c)10m-0.93m-10m

Keywords galvanic corrosion; seawater piping system; electrochemistry

Reference

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