Electrochemical corrosion behavior of titanium alloy TA2 in HCl+HBr environment containing $NaNO_2$

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Abstract Based on the fact that the synthesis process of organic substances such as vitamins usually involves the metal corrosion under acidic solutions containing oxidizing agents, the corrosion behavior of pure titanium TA2 under the HCl+HBr solution containing $NaNO_2$ under different temperatures was investigated by electrochemical measurements in this work. The results show that the corrosion potential of TA2 shifted negatively with increasing temperature and the corrosion current density gradually increased in pure HCl+HBr. However, after adding 0.5% $NaNO_2$ to HCl+HBr solutions, the corrosion potential of TA2 shifted positively with increasing temperature and the corrosion current density gradually decreased. Continuing to increase $NaNO_2$ to 1.0%, TA2 restored the pattern of negative shift of corrosion potential and increasing corrosion current density as temperature increases (15 ^oC to 45 ^oC). When temperature exceeded 45 ^oC, the corrosion current of TA2 began to decrease and the corrosion potential gradually shifted positively. The corrosion resistance of TA2 began to increase under 55 ^oC, which may be due to the strong oxidizing property of $NaNO_2$ that facilitates the passivation of TA2 under the acidic condition[1]. Therefore, $NaNO_2$ as an oxidant to promote the passivation of TA2 in acidic environments requires a specific concentration and temperature range.

Keywords corrosion；$NaNO_2$；titanium; HCl; HBr

Reference

[1] Li, X., Zhang, P., Huang, H., Hu, X., Zhou, Y., & Yan, F. (2019). An electrochemical study of pH influences on corrosion and passivation for a Q235 carbon steel in HNO_3-$NaNO_2$, HAc- $NaNO_2$ and HCl–$NaNO_2$ solutions. *RSC advances*, *9*(67), 39055-39063.