

研究论文

两种不锈钢在单相流和液/固两相流中冲刷与腐蚀的交互作用

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摘要: 用质量损失法研究了65Mn和316L及其Ni-P镀层的冲刷腐蚀行为。结果表明: 在试样表面与流体间相对运动距离相同的条件下, 65Mn和316L在单相流和两相流中的冲刷腐蚀速率随着介质温度的升高和理论流速的减小而增大。在20% H<sub>2</sub>SO<sub>4</sub>单相流和20% H<sub>2</sub>SO<sub>4</sub>+20 g/L黄砂两相流(50℃, 1.88 m/s)中, 冲刷与腐蚀的交互作用引起的65Mn质量损失速率分别为80.35和127.21 g·m<sup>-2</sup>·h<sup>-1</sup>, 而316L则分别为5.25和17.22 g·m<sup>-2</sup>·h<sup>-1</sup>。在两相流中, 65Mn和316L的冲刷腐蚀机制分别为均匀腐蚀+轻微微切削和轻微选择性腐蚀+轻微塑性变形。Ni-P化学镀层可显著改善65Mn和316L的冲刷腐蚀性能, 且温度和理论流速越高效果越显著。

关键词: 材料失效与保护 65Mn 316L Ni-P 液/固两相流 冲刷腐蚀 交互作用

Erosion - corrosion Synergism of 65Mn and Stainless Steel 316L in Single Liquid Phase and Liquid/Solid Two - Phase Flow

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Abstract: The erosion corrosion behaviors of 65Mn and 316L were investigated systematically by mass loss test method. The results show that the erosion corrosion rates of 65Mn and 316L in single liquid phase and liquid/solid two - phase flow increase with increase of media' s temperature and decrease of theoretic velocity of flow under the condition of same flow distance. Their mass loss rates caused by synergistic effect between erosion and corrosion in 20% H<sub>2</sub>SO<sub>4</sub> and 20% H<sub>2</sub>SO<sub>4</sub> + 20 g/L sand (50℃, 1.88 m/s) were respectively 80.35 and 127.21 g · m<sup>-2</sup> · h<sup>-1</sup> for 65Mn and 5.25 and 17.22 g · m<sup>-2</sup> · h<sup>-1</sup> for 316L. The mechanism of the erosion corrosion in two - phase flow were respectively even corrosion + slightly plough - cutting for 65Mn and slightly select corrosion + slightly plastic deformation for 316L. The erosion corrosion resistances of 65Mn and 316L were improved significantly by electroless plating Ni - P. The higher the media' s temperature and velocity of flow, the more significant the effect.

Keywords: materials failure and protection 65Mn 316L Ni - P liquid/solid two - phase flow erosion corrosion, synergistic effect

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