

RESEARCH PAPERS

池式沸腾下PAA与PBTCa对CaCO₃结垢的影响

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摘要 Formation of mineral scales on heat exchangers is a persistent and expensive problem. In the present paper, the calcium carbonate scale inhibition by two inhibitors, polyacrylic acid (PAA) and 2-phosphonobutane-1,2,4-tricarboxylic acid (PBTCa) has been studied in a pool boiling system. It is found that PBTCa has a better inhibition effect than PAA under the identical conditions. X-ray diffraction (XRD) and Fourier transform-infrared (FTIR) analyses demonstrate that the content of vaterite increases as inhibition effects increase. The metastable crystal forms of vaterite and aragonite are stabilized kinetically in the presence of inhibitors. The relationship between the inhibition effect and the fractal dimension has also been investigated. The result shows that the fractal dimension is higher in the presence of inhibitors. The better the inhibition effect, the higher the fractal dimension. The step morphology was observed by atomic force microscopy (AFM) images. It is shown that the step space on the calcium carbonate surface increases in the presence of inhibitors. Moreover, with the increase of inhibition effect, both the step space and the fractal dimension increase. The step bunching is found on the calcium carbonate by AFM. The better the inhibition effect of the inhibitor, the slower the step velocity in the unbunched location. As a result, the step space becomes wider in the presence of PBTCa than that in the presence of PAA.

关键词 [calcium carbonate](#) [scaling](#) [inhibitor](#) [atomic force microscopy](#) [fractal](#)

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Effects of PAA and PBTCa on CaCO₃ Scaling in Pool Boiling System

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