

论文

己内酰胺精制薄膜蒸发器腐蚀失效分析

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摘要:

用光学显微镜、扫描电镜和能谱分析等技术分析己内酰胺精制用薄膜蒸发器腐蚀减薄器壁的化学成分、金相组织、腐蚀形貌和腐蚀产物。结果表明: 蒸发器内壁减薄主要是由于高速液膜流体所造成的有机酸冲刷腐蚀所致, 装置提量后加剧了腐蚀减薄的速度。通过电化学极化测量304L、316、321三种不锈钢在酸性己内酰胺介质中的耐蚀性进行了比较, 证实316不锈钢的耐冲刷腐蚀性能较好。

关键词: 己内酰胺 薄膜蒸发器 有机酸 冲刷腐蚀

Corrosion failure analysis of thin-film evaporator for caprolactam production

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Abstract:

This paper mainly analyses the cause and principle of the failure of thin - film evaporator unit for purification processes in producing caprolactam. The device was forced to shutdown because of the decrease of wall thickness from 13.00 mm to 6.58 mm. The results of microstructure and chemical composition analysis showed the failed component is eligible 304L stainless steel. By means of scanning electron microscopy it was found that there were corrosion ditches along the line of liquid flow and loose corrosion production layer on the surface of inner wall. Energy spectrum analysis showed the selective dissolution of elements Fe , Ni resulted in enrichment of Cr in the thinner corrosion production layer. According to the results of sample analysis and investigation of the operating conditions, it is confirmed that erosion - corrosion caused by high - speed liquid film containing organic acid is the main cause of the failure of the inner wall, and the corrosion thinned rate was accelerated after improving processing capacity. Moreover, corrosion resistance of stainless steels 304L,316,321 in acidic caprolactam solution was analyzed by potentiodynamic polarization curve measurement. It was confirmed that 316 stainless steel possessed better corrosion resistance to liquid flow.

Keywords: caprolactam thin-film evaporation organic acid erosion-corrosion

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