内径 20mm 导向套筒内壁处理(1):空心阴极氩气放电特性研究 *

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摘　要:针对高端阀门内径 20mm 导向套内壁处理,采用高频高压脉冲电源,研究了氩气气氛下工作气压、脉冲电压和频率等参数对导向套空心阴极放电伏安特性的影响,并对工件间距及与阳极距离等放电结构进行了研究。结果表明:管内空心阴极放电需要一个稳定过程,脉冲电流随着时间的增加逐步降低,而后达到稳定放电阶段。提高脉冲电压或工作气压,管内空心阴极脉冲峰值电流增加。脉宽或频率的增加,脉冲峰值电流不变,但平均电流增加,且频率的增加使得激励时间减少。放电结构的分析表明,管间距的减少,放电电流变化不大,而管口与阳极之间距离的减少,使得放电峰值电流略有增加。以上研究结果为高端阀门小直径导向套等内壁薄膜制备提供了有效指导。

关 键 词:导向套;内壁;空心阴极;放电特性
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Treatment of Inner Surface of Guide Sleeve with Inner Diameter of 20mm(1): Characteristics of Argon Hollow Cathode Discharge

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Abstract: The influence of working pressure, pulse voltage and frequency on the volt-current characteristics of hollow cathode discharge in argon atmosphere was studied by using high frequency and high voltage pulse power supply for the inner surface treatment of 20mm guide sleeve of high-end valve. Discharge structures such as tube spacing and anode distance were also studied. The results show that the discharge of hollow cathode in tube needs a stable process, and the pulse current decreases gradually with the increase of time, and then reaches a stable discharge stage. The peak current of hollow cathode pulse increases with the increase of pulse voltage or working pressure. With the increase of pulse width or frequency, the peak current of the pulse does not change, but the average current increases, and the excitation time decreases with the increase of frequency. The analysis of discharge structure shows that the peak discharge current increases slightly with the decrease of tube spacing and the decrease of the distance between tube orifice and anode. The above results may provide effective guidance for the preparation of inner wall film such as small diameter guide sleeve of high-end valves.

Key words: guide sleeve; inner surface; hollow cathode; discharge

在材料表面工程中,管状材料的内表面处理一直是一个难题,但内表面处理却有着大量的应用需求,例如高端阀门导向套、飞机起落装置的液压管道、汽车发动机管线、以及石油和化工产品的运输管线等,这些应用领域对管材内表面的性能如耐腐蚀、耐磨损等提出了越来越高的要求[1-3]。

对于管筒内表面处理,国内外的研究人员利用化学气相沉积、物理气相沉积、电弧离子镀、离子注入等多种技术进行了大量研究,如巴

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