表面与界面工程

# 机械密封摩擦副端面分形维数的优化

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摘要

机械密封摩擦副接触端面的分形维数对摩擦副摩擦磨损特性和密封性能有着重要的影响。依据机械密封摩擦副端面接触分形模型和泄漏分形模型，分别研究了有利于减轻端面磨损的最优分形维数和基于允许泄漏率的最优分形维数。用数值计算方法得出了NHM70型机械密封摩擦副端面弹性接触面积比$A_{re}/A_r$与分形维数$D$的关系曲线及泄漏率$q$与分形维数$D$的关系曲线。在自行设计的试验装置上，进行了NHM70型机械密封试验研究。通过理论计算和试验验证表明，在综合考虑磨损率、泄漏率和加工成本后，NHM70型机械密封软质环端面的最优分形维数为1.61。

关键词

机械密封　摩擦副　端面　分形维数　优化

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# Optimization of surface fractal dimension of friction pair in mechanical seals

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**Abstract**

The fractal dimension of the contacting surface of friction pair has significant influence on the sealing behavior and friction characteristics of mechanical seals.According to the contact fractal model and leakage fractal model of the end face of the friction pair，the optimum fractal dimension，beneficial to alleviating the wear of the end face and the optimum fractal dimension related to the allowable leakage rate were studied respectively.The relationship between elastic contacting area ratios of NHM70 type mechanical seal $A_{re}/A_r$ and the fractal dimension $D$，as well as the relationship between leakage rate $q$ and fractal dimension $D$，were obtained by numerical calculation.Experimental studies on NHM70 type mechanical seals were also carried out on a self-designed testing device.The theoretical calculation and the experimental studies showed that the optimum fractal dimension of the soft ring surface of NHM70 type mechanical seal was 1.61 after comprehensively considering the wear rate，leakage rate and manufacturing cost.

**Key words**

mechanical seal　friction pair　end face　fractal dimension　optimization

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