

Mechanical Characteristic Analysis of Micro-gear Meshing Transmission

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1. Introduction

Mechanical transmission is an effective means to achieve continuous, complex and actual movement. It has some characteristic, such as high transmission precision, fast response and high transmission efficiency. The micro transmission mechanism is a necessary part to implement a complex mechanical movement for MEMS (micro electro-mechanical system). Micro-gear meshing transmission, as an important part of transmission mechanism, has attracted the attention of researchers in the world.

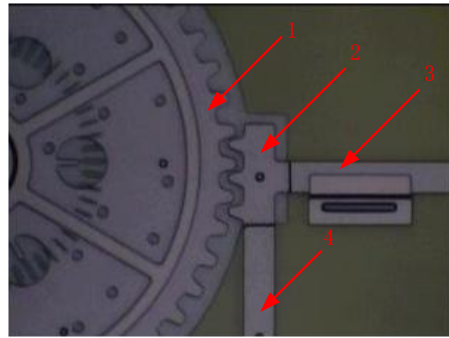
The micro actuator provides the required driving torque for transmission mechanism. The resistance moment is constituted of surface force and friction. If the resistance moment is larger than driving torque, the micro gear will not be pushed to rotate. Due to the characteristic of micro machining process, the micro devices is more susceptible to surface force, which has also influence on structural geometry and working environment. When a pair of gears is meshing, the friction force will change with meshing process. It will change from critical friction to dynamic friction. Friction and wear will become the one of key factors in the development of MEMS device to be practical and market-oriented, and are also the one of the important directions in MEMS research.

2. Research method

In order to know more about the friction and adhesive contact performance between the meshing gears, a micro gear mechanism is designed. Theoretical model about the driving voltage, static friction and pressure are established to analysis the influence of friction, adhesion force and capillary force about the transmission characteristics. Then some ways will be put forward to improve the mechanical characteristics of micro gear.

3. Transmission mechanism

A micro-gear meshing transmission system is developed to simulate the mechanical properties on contact surfaces of poly crystal silicon based on MEMS devices, shown as Fig. 1. And some tribological problems will further be discussed.



1 micro-gear, 2 driving gear rack, 3 horizontal micro actuator, 4 vertical micro actuator

Fig. 1 diagram of micro-gear meshing transmission system

4. References

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