Performance analysis of PDMS polymer as a MEMS FPOTF actuator

Abstract

The usage of polymer as Micro-electro-mechanical system (MEMS) actuator has received a great intention due to high elasticity characteristic, hence lower the power consumption [1]. Poly-dimethyl siloxane (PDMS) is one of the polymers that widely used in MEMS application. This chapter evaluates the suitability of PDMS as MEMS Fabry Perot Optical Tunable Filter (FPOTF) with electrostatic actuator. Poly-dimethly siloxane (PDMS) is commonly used in MEMS fluidic systems. In general, this type of polymer is more robust and high elasticity compared with other semiconductor material such as silicon [1]. Furthermore, PDMS is moderate in terms of temperature and humidity sensitivity as well as consume low processing and preparation cost. These factors make PDMS receive a great intention in many areas of MEMS application. In literature, PDMS as a MEMS actuator have been realized using several actuation methods. One type of sealed PDMS which is parylene-caulked PDMS is used in pneumatic actuator and shown a superior deflection for a given force which is bigger than 5kPa [2]. High deflection for a small given force shows the suitability of PDMS in MEMS electrostatic actuator. PDMS will reduce the consumption of DC voltage for a same amount of deflection compared with other semiconductor material. In this chapter, PDMS is proposed to be used as electrostatic actuator in MEMS FPOTF. PDMS will be used as a mirror holder and actuate in order to vary the length of cavity for wavelength tuning in CWDM wavelength region. Related theory, analytical model and analysis are presented in next section.