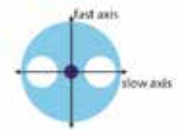
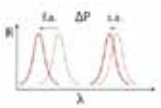
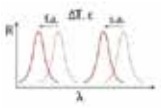
MULTI-PARAMETER SENSING

A Fiber Bragg Grating (FBG) is a periodic modulation of the refractive index along a single mode fiber core. The periodicity results in reflection of light waves that match the periodic spacing in wavelength, while other wavelengths are transmitted unperturbed.

Due to environmental changes (temperature, strain, pressure etc.) the refractive index and grating period are influenced which result in a wavelength shift of the reflected peak. Precise monitoring of the spectral peak positions can thus be used for sensing. In many applications it is desirable to distinguish between physical contributions to the Bragg shift, e.g. Temperature and strain, or Temperature and pressure. Different approaches can be taken towards separation, such as the use of an additional FBGs in strain-free condition for Temperature correction. However, multiparameter sensing is also achievable in single FBG sensors, by use of polarization maintaining (PM) fibers.







PM fibers have a stress-induced birefringence, resulting in splitting of a waveguide mode into two orthogonal waveguide modes. An FBG written in a PM fiber, allows separate interrogation of the FBG peak in the two polarization axes (fast and slow). The birefringence results into FBG peak splitting as the refractive index in both polarization differs by Δn. As a function of temperature or strain, the peaks shift differently, allowing for separation of variables.

Another version of multi-parameter sensing involves the separation between pressure and temperature. Instead of applying stress rods like in PM fibers, airy holes can be used in the fiber. As a function of pressure, a differential peak shift will occur, unlike with Temperature.

OEM LadyGator

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