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An Interrogation Technique for Fiber Bragg Grating Sensors Based on a Light Emitting Diode and a Photodiode.

ABSTRACT - Masterthesis

Fiber Bragg Gratings are set to revolutionize impact on optical fiber sensor field. A periodic modulation of refractive index along the core of an optical fiber acts as a fiber optic Filter element, which is known as a fiber Bragg grating (FBG). The Filter wavelength is also called Bragg wavelength dependent on strain and temperature. So that FBGs as well as fiber optic sensors are used for the measurement of suitable strains and temperatures. These sensor elements are mainly used as temperature sensor for medical application and strain sensor for the measurement in composite materials. The Fabrication of the Fiber Bragg Gratings relatively easy and inexpensive when it is written with an ultra-violate (UV) laser. The advantages offered by optical fiber, such as low loss transmission immunity to electromagnetic interference, light weight and electrical isolation make it an ideal candidate for sensor as well as in tele-communication. The versatility of the Fiber Bragg Grating (FBG) has increased the activity of new innovations in the field of optical based sensors.

In this work, a method for point-by-point production was developed to create Bragg grating structures inside the core of a multimode fiber by using femtosecond laser pulses. An amplified Ti: Sapphire laser with a pulse length smaller than 108 fs, a wavelength around 800 nm and a repetition rate of 100Hz was used. To increase the intensity of the reflected spectrum, multiple numbers of FBGs were written next to each other into the fiber's 50 µm core. The spectral signal of the Bragg grating written into the core of a graded-index multimode optical fiber was analyzed and investigated experimentally to get the maximum reflection.