

FEATURES OF MANUFACTURING FIBER BRAGG GRATINGS

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Abstract. Features of manufacturing fiber Bragg gratings, which are sensors based on fiber Bragg gratings. The types of Bragg lattices are considered, i.e. straight homogeneous lattices, lattices with variable periods, lattices with a long period, oblique lattices.

Keywords: Fiber Bragg gratings, reflection spectrum, sensors, period.

One of the most commonly used fiber-optic sensors are sensors based on fiber-Bragg gratings. The gratings reflect a light signal, the spectral characteristic of which (wavelength) shifts along with the change in the measured parameter (temperature). In the manufacture of gratings, an area with a periodic change in the refractive index is created inside the core, and this area is directly called the VBR. A fiber Bragg lattice is a section of an optical fiber in the core of which the refractive index periodically changes in the longitudinal direction], which is shown in Figure 1 [1].

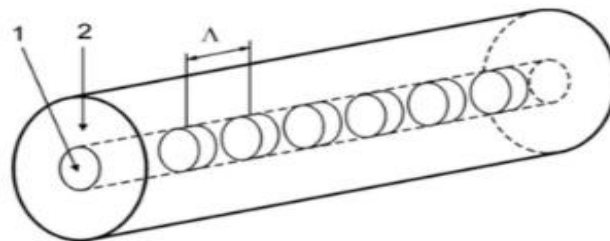


Figure 1. Fiber-bragg lattice where: 1- is the core, 2 - is the cloak, λ - is the lattice period

The reflection spectrum of the fiber bragg lattice, depending on the wavelength, is shown in figure 2.

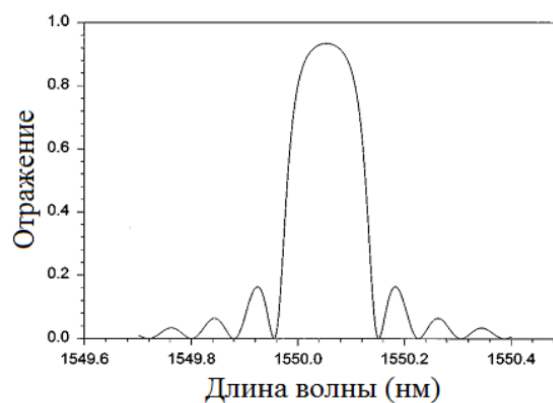


Figure 2. The reflection spectrum

Straight homogeneous gratings are a distributed bragg reflector formed in the light-carrying core of an optical fiber. straight homogeneous gratings have a narrow reflection spectrum, are used in fiber lasers, fiber-optic sensors, to stabilize and change the wavelength of lasers and laser diodes, etc. (fig.3).

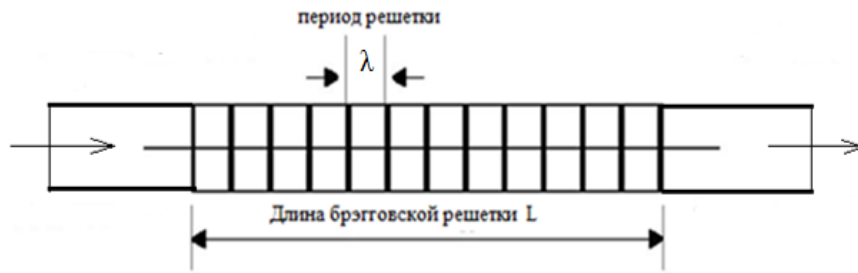


Figure 3. Structure of a straight homogeneous lattice

A chirped bragg lattice is called a bragg lattice, which has a period dependence along the direction of light propagation (chirp). Different wavelengths are reflected from the bbr at different depths having the corresponding period. the most common chirped bragg gratings with linear chirp. Thirped gratings are mainly used to compensate for dispersion [2]. The production of chirped bragg gratings (cbr) consists of the narrowing and bending of the optical fiber during recording and the linear stretching of the phase mask obtained when it is heated. phase masks with variable pitch are also used in the production of chirped bragg gratings. in lattices, chirp denotes an increase or decrease in the lattice period, and this change in the length of the period is most often linear. The cross-section of the structure formed on the fiber core is shown in figure 4.

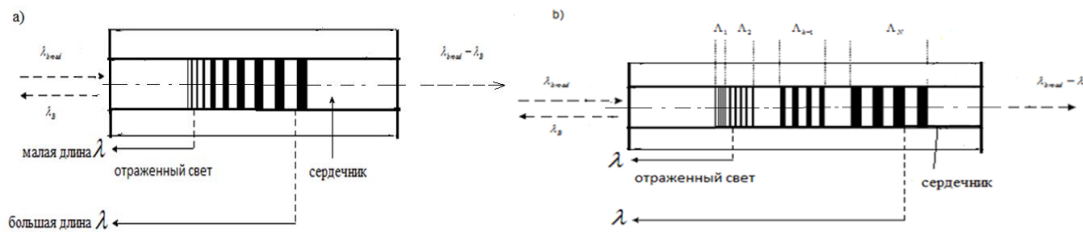


Figure 4. The structure of the chirped bragg lattice (cbr):
 a) chirping of the bragg lattice, b) cascade chirped lattice

The lattices shown in figure 4 can be obtained using fixed changes in the lattice period λ or by changing the refractive index in the core. Such a lattice can be used for different wavelengths. In chirped lattices, the frequency resonance is a linear function symmetric along the lattice [3]. Individual frequencies are reflected in different places of the grid. This results in different delay times. a temporary extension of the pulse is possible (figure 5).

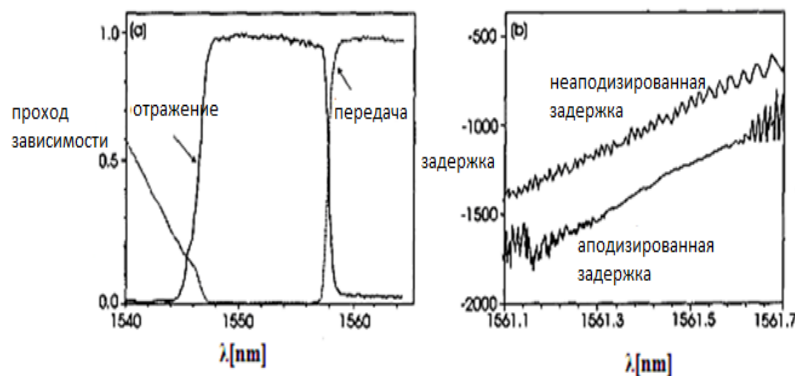


Figure 5. Characteristics of a typical bbr grating
 a) transmission reflection profile, b) apodized and non-apodized group delay

In addition, fiber-optic amplifiers with light pumps are used in telecommunication systems [4]. They reduce the performance of the entire system by increasing the noise level by using wavelengths that have not been absorbed. This can be avoided by using chirped gratings that reject unoccupied wavelengths and leave only those that are really needed. this reduces the noise level. Such gratings can be used in the design of erbium optical amplifiers [5]. Chirped gratings are increasingly used as elements in telecommunication systems.

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ОСОБЛИВОСТІ ВИГОТОВЛЕННЯ ВОЛОКОННИХ БРЕГГІВСЬКИХ РЕШІТОК

Анотація. Особливості виготовлення волоконних бреггівських решіток, які являють собою датчики на основі волоконних бреггівських решіток. Розглядаються типи бреггівських решіток, тобто прями однорідні решітки, решітки зі змінними періодами, решітки з великим періодом, похилі решітки.

Ключові слова: Волоконні бреггівські решітки, спектр відбиття, датчики, період.

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