FBG Features, Sensing Principle and Proposed Method

When a broad operation of light beam is directed to an FBG, reflection of each segment of alternating wavelength is caused by a Bragg wavelength, while the Bragg wavelength remains constant. Using the expression for Bragg wavelength obtained in [2]

\[ \lambda_B = \frac{2n_0d}{\sin \theta} \]

Damping in FBGs can be due to light absorption, environment, or even phase (laser) fluctuations. The Bragg wavelength shift \( \Delta \lambda \) as a function of environmental parameters can be described as 

\[ \Delta \lambda = \Delta \lambda_B + \Delta \lambda_T + \Delta \lambda_w \]

where \( \Delta \lambda_B \) and \( \Delta \lambda_T \) are the Bragg wavelength shift due to temperature and water, respectively. The water sensitivity of the FBG can be determined by

\[ S_{\text{RH}} = \frac{\Delta \lambda_{\text{RH}}}{\Delta \text{RH}} \]

Therefore, we can use this sensitivity to measure RH.

**References**


**Results on 4 samples of FOS RH Sensors:**

- The radiation hardness of the FOS RH sensors is not affected by dose variations.
- The observed radiation-induced Bragg shift is observed.
- The radiation-induced Bragg shift shows the effect of high RH sensitivity after irradiation.
- The RH sensitivity of the FBG sensors is not affected by dose variations.
- The observed radiation-induced Bragg shift is observed.
- The RH sensitivity of the FBG sensors is not affected by dose variations.
- The observed radiation-induced Bragg shift is observed.
- The RH sensitivity of the FBG sensors is not affected by dose variations.
- The observed radiation-induced Bragg shift is observed.

**Radiation Hardness Behaviour of the FOS T Sensors**

- Progressive irradiation up to 210kGy is performed by using 2 photons in order to:
  - Determine the radiation-induced shift \( \Delta \lambda \) in RS
  - Investigate the RH sensitivity of the RH sensor after irradiation.

In total 4 sensors of (2 different batches) are tested:

- The observed radiation-induced Bragg shift decreases with the sum of absorbed dose and time of detector exposure.
- The RH sensitivity of the Ranges of RH of the sensors are mapped for the full irradiation on time.

**Radiation Hardness Behaviour of the FOS RH Sensors**

- Progressive irradiation up to 210kGy is performed by using 2 photons in order to:
  - Determine the radiation-induced shift \( \Delta \lambda \) in RS
  - Investigate the RH sensitivity of the RH sensor after irradiation.

In total 4 sensors of (2 different batches) are tested:

- The observed radiation-induced Bragg shift decreases with the sum of absorbed dose and time of detector exposure.
- The RH sensitivity of the Ranges of RH of the sensors are mapped for the full irradiation on time.

**Conclusions**

- The observed radiation-induced Bragg shift decreases with the sum of absorbed dose and time of detector exposure.
- The RH sensitivity of the Ranges of RH of the sensors are mapped for the full irradiation on time.
- The observed radiation-induced Bragg shift decreases with the sum of absorbed dose and time of detector exposure.
- The RH sensitivity of the Ranges of RH of the sensors are mapped for the full irradiation on time.
- The observed radiation-induced Bragg shift decreases with the sum of absorbed dose and time of detector exposure.
- The RH sensitivity of the Ranges of RH of the sensors are mapped for the full irradiation on time.