

# **Influence of surrounding media refractive index on the thermal and strain sensitivities of long-period gratings**

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## **Abstract**

A detailed study of the thermal and strain sensitivities of a long-period grating when the device is immersed in different external media is presented. The range of refractive indices analyzed are within 1.000 to 1.447, corresponding to samples of air, water, ethanol, naphtha, thinner, turpentine, and kerosene. Within the same range of refractive indices, the strain sensitivity is between  $(-0.24 \pm 0.03)$  and  $(-0.94 \pm 0.11)$  pm/ $\mu\epsilon$ . For the grating immersed in these fluids, the refractive index sensitivity ranges from  $-3$  to  $-1035.6$  nm per refractive index units. The coupling thermo-optic coefficients and the strain-optic coefficients are also measured, resulting in the range from  $(2.45 \pm 0.04) \times 10^{-5}$  to  $(15.89 \pm 0.82) \times 10^{-5}$  deg  $C^{-1}$  and  $(-1.15 \pm 0.04)$  to  $(-1.61 \pm 0.04)$   $\mu\epsilon^{-1}$ , respectively. A noticeable nonlinear behavior of the thermal sensitivity is found for external media with refractive indices higher than 1.430.