OPTICAL FIBER SENSORS BASED ON LOSSY MODE RESONANCE USING GRAPHENE MATERIALS

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ABSTRACT TEXT

Optical fiber sensors (OFS) have attracted increasing attention due to their benefits compared to traditional sensors, such as small size, low cost, biocompatibility, remote sensing ability or safety in flammable environments. Among the different existing configurations of OFS, those based on electromagnetic resonances, such as Surface Plasmon Resonance and Lossy Mode Resonance (LMR) are very popular.

When an optical fiber is coated with a thin-film, different electromagnetic resonances can be generated depending on the properties of the materials involved in the system (the waveguide, the coating and the external medium). These resonances produce a stable absorption band in the transmitted spectrum that shifts in wavelength if the refractive index (RI) of the coating varies. Then, if this parameter is sensitive to a determined analyte, the presence of this analyte will lead to a measurable shift of the absorption peak. This is the basis of the sensing mechanism.

In particular, LMRs are more versatile and cheaper as they can be supported by a wide range of materials, including metal oxides and polymers. In this regard, graphene-based materials are ideal candidates for the fabrication of the coatings required by LMR sensors due to its superior properties, such as surface area, mechanical strength and extreme sensitivity to the external environment. Consequently, in this work highly sensitive OFS using LMRs and graphene-based materials have been designed and fabricated. This is a new concept and, to the best of our knowledge, the first LMR-based OFS using graphene materials.