Novel technology affordable for developing new stretchable opto-mechanical devices with larger mechanical tunability, versatility and sensitivity

Researchers from Spanish National Research Council (CSIC), Catalan Institute of Nanoscience and Nanotechnology (ICN2-BIST), Biomedical Research Centre Network (CIBER) and Catalan Institution for Research and Advanced Studies have recently developed the first stretchable plasmonic enhanced wrinkled Fabry-Perot cavities showing extremely high sensitivity to mechanical deformations. This novel technology allows the development of new stretchable opto-mechanical devices with larger mechanical tunability, versatility and sensitivity.

Manufacturers in the field of sensors for detection of mechanical deformations, pressure or force are being sought to collaborate and/or exploit the existing know-how through a patent license agreement.

An offer for Patent Licensing

Stretchable plasmonic enhanced wrinkled Fabry-Perot cavity

Miniaturization, battery improvements and lower hardware manufacturing costs are just some of the many factors that have driven the use of wearables, which are demanding sensors with more and more new features.

This invention describes a novel opto-mechanical device with ultrahigh sensitivity to strain deformations showing 16-fold lower detection limit than state of the art optical strain sensors.

The device is based on a novel stretchable plasmonic enhanced wrinkled Fabry-Perot cavity, in which mechanical deformations simultaneously generate large spectral shifts in the cavity resonances and variations of their quality factor. This combination enables the new sensing parameter "spectral area" boosting the sensitivity to detect the mechanical deformations.

These devices are fabricated via an innovative self-assembled and self-embedded process to integrate the arrays of plasmonic nanostructures at controlled depths in the elastomer film and to generate the cavity wrinkles by exploiting the catalytic properties of the nanostructures. This novel technology opens the path to develop new stretchable opto-mechanical devices with larger mechanical tunability, versatility and sensitivity, for new sensors such as strain, force and pressure sensors and/or mechanically tunable optical filters and/or modulators.

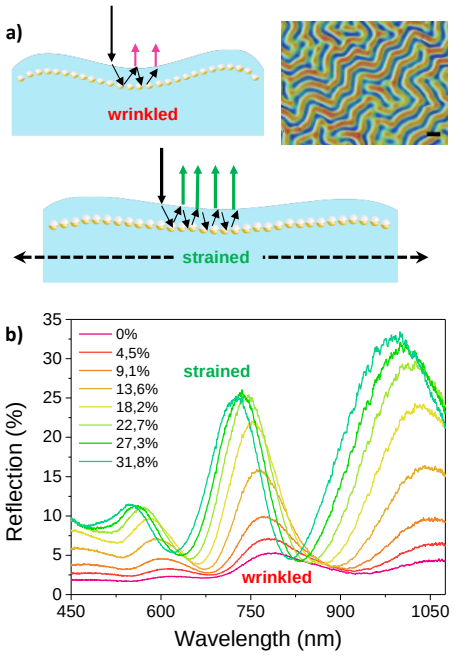

Fig 1. Stretchable plasmonic enhanced Fabry-Perot cavity. a) Schematic device b) experimental optomechanical response

Main innovations and Advantages

- First soft stretchable plasmonic enhanced Fabry-Perot (FP) cavity.
- Extreme sensitivity of the cavity resonances to mechanical deformations.
- New detection method based on the "spectral area" to maximize the sensitivity to strains.
- Experimental strain detection limit of 0.006%, i.e., 16-fold lower than state of the art optical strain sensors.
- Cost effective and simple fabrication via self-embedding of the arrays of plasmonic nanostructures into the elastomeric films.

Patent Status

Priority patent application filed suitable for international extension

For more information, please contact:

Isabel Gavilanes-Pérez, PhD.

Deputy Vice-Presidency for Knowledge Transfer. Spanish National Research Council (CSIC)

Tel.: +34 – 93 594 77 00
Fax: +34 – 93 580 14 96

E-mail: isabel.gavilanes@csic.es
comercializacion@csic.es