Novel affordable technology to develop new stretchable opto-mechanical detectors with higher mechanical sensitivity, tunability and versatility

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 enables developing new stretchable opto-mechanical devices with higher mechanical sensitivity, tunability and versatility.

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

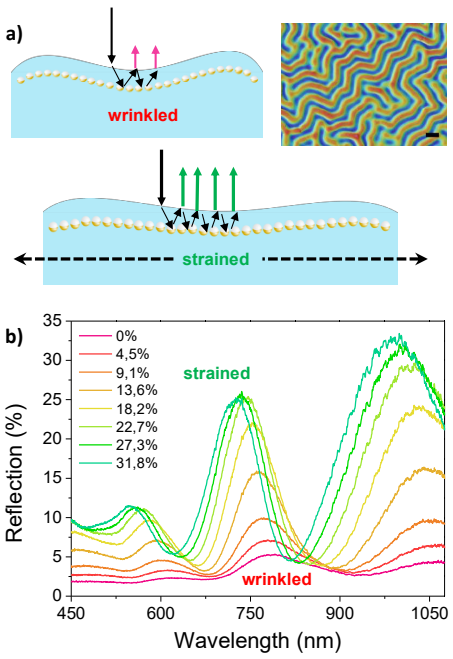
An offer for Patent Licensing

Stretchable plasmonic enhanced wrinkled Fabry-Perot cavity

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 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 higher mechanical sensitivity, tunability, and versatility for new **strain, force and pressure sensors in wearable and/or industrial applications, mechanically tunable optical filters and modulators, and mechanically controlled translucent elastic films**.



a) Schematic of the stretchable plasmonic enhanced Fabry-Perot cavity device, and 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 arrays of plasmonic nanostructures into elastomeric films.
- Wireless detection of mechanical deformations.
- Integration into biocompatible elastomers for wearable applications.

Patent Status

Priority patent application filed suitable for international extension

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