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Title:Label-free bacteria detection using evanescent mode of a suspended core terahertz fiber
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Abstract:We propose for the first time an E. coli bacteria sensor based on the evanescent field of the fundamental mode of a suspended-core terahertz fiber. The sensor is capable of E. coli detection at concentrations in the range of 10⁴-10⁹ cfu/ml. The polyethylene fiber features a 150 μm core suspended by three deeply sub-wavelength bridges in the center of a 5.1 mm-diameter cladding tube. The fiber core is biofunctionahzed with T4 bacteriophages which bind and eventually destroy (lyse) their bacterial target. Using environmental SEM we demonstrate that E. coli is first captured by the phages on the fiber surface. After 25 minutes, most of the bacteria is infected by phages and then destroyed with ~1μm-srze fragments remaining bound to the fiber surface. The bacteria-binding and subsequent lysis unambiguously correlate with a strong increase of the fiber absorption. This signal allows the detection and quantification of bacteria concentration. Presented bacteria detection method is label-free and it does not rely on the presence of any bacterial "fingerprint" features in the THz spectrum.
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Inspec controlled terms:biological techniques - biosensors - fibre optic sensors - microorganisms - polymer fibres
Uncontrolled terms:label-free bacteria detection - evanescent mode - suspended core terahertz fiber - E. coli bacteria sensor - polyethylene fiber - T4 bacteriophages - SEM - THz spectrum - time 25 min
Inspec classification codes:A4281P Fibre optic sensors; fibre gyros - A8780B Biosensors - B7230E Fibre optic sensors - B7230J Biosensors - B7510 Biomedical measurement and imaging
Numerical data indexing:time 1.5E+03 s
Treatment:Experimental (EXP)

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