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Title:Integrated waveguide structure for highly sensitive THz spectroscopy of nano-liter liquids in capillary tubes

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Abstract:Terahertz dielectric spectroscopy permits the study of biomolecular interactions. However, water induces high attenuation of electromagnetic waves in the THz frequency range, obscuring the response of biomolecules. The developed sensor overcomes this problem by concentrating the THz wave propagating in an integrated waveguide on a small liquid volume contained within a capillary tube. Detailed electromagnetic modeling shows effective interaction between the THz waves and liquids. Transmission measurement results for capillary tubes filled with water and methanol mixtures demonstrate a substantial increase in sensitivity to changes of liquid permittivity. The current integrated sensor facilitates THz spectroscopy of biological liquids: a case study on buffered human serum albumin solution demonstrates a great potential to complement biochemical analytical tools.

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