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Flexible and tunable metamaterials and their applications in sensing XINGLIN WEN, GUANGYUAN LI, JUN ZHANG, QING ZHANG, BO PENG, Division of Physics and Applied Physics, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore 637371, LAI MUN WONG, SHIJIE WANG, Institute of Materials Research & Engineering, Agency for Science, Technologies and Research, 3 Research Link, Singapore 117602, QIHUA XIONG, Division of Physics and Applied Physics, School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore 637371 — Attributing metamaterials (MMs) to flexible substrates can provide many advantages such as transparency, lightweight, deformability and biocompatibility, and provides additional benefits to practical applications of metamaterials. Herein, we demonstrate a very simple and effective nickel sacrificial layer-assisted transfer method to fabricate Visible-Near IR metamaterials on polydimethylsiloxane (PDMS). The PDMS-MMs can serve as a well-defined and reproducible Surface-enhanced Raman Scattering (SERS) substrate and it can be covered to the surface with interesting analytes attached to obtain the SERS signal. Hybridizing a metamaterial with phase change material vanadium dioxide (VO_2) is very another promising way to achieve active metamaterial devices. Both the electric and magnetic resonances frequency of a split ring resonator can be tuned by controlling the phases of VO_2 by tuning the temperature. We also demonstrated that this VO_2-based metamaterials device can be used to tune the SERS intensity, which suggests considerable potential as an active sensing device.

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