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Infrared nano-imaging of plasmonic hotspots on graphene nano-bubbles ZHE FEI, UC San Diego & Argonne Natl Lab, JONATHAN FOLEY, Argonne Natl Lab, WILL GANNETT, ALEX ZETTL, UC Berkeley, MENGKUN LIU, Stony Brook University, GUANGXIN NI, SIYUAN DAI, UC San Diego, FRITZ KEILMANN, Ludwigs-Maximilians-Universität, ANTONIO CASTRO NETO, National University of Singapore, STEPHEN GRAY, GARY WIEDERRECHT, Argonne Natl Lab, MICHAEL FOGLER, DIMITRI BASOV, UC San Diego — One of the major goals of plasmonics is to achieve strong enhancement of electromagnetic energy by forming plasmonic hot spots for various applications including bio-sensing, single molecule fingerprinting, surface enhanced spectroscopy, and etc. Here, we demonstrate by infrared nano-imaging that nano-bubbles formed on graphene/hexagonal boron nitride heterostructures are ideal for trapping electromagnetic energy thus forming ultra-confined plasmonic hot spots. The distributions of these hot spots are sensitively dependent on the size and shape of these nano-bubbles as well as the ingredients inside. Further analysis indicates that the observed plasmonic hotspots are formed due to a significant enhancement of the plasmon wavelength and intensity above graphene nano-bubbles filled with air or other low-k dielectric materials. Our work presents a novel scheme for plasmonic hot spots formation and sheds light on future applications of graphene nano-bubbles for plasmon-enhanced single molecule characterization.

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