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Tunable polaritons from plasmon-phonon coupling in hyperbolic media SIYUAN DAI, Univ of California - San Diego, QIONG MA, Massachusetts Institute of Technology, SHOU-EN ZHU, Delft University of Technology, Netherlands, MENGKUN LIU, University of California, San Diego, TROND ANDERSEN, Massachusetts Institute of Technology, ZHE FEI, MICHAEL GOLDFLAM, MARTIN WAGNER, Univ of California - San Diego, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science, Japan, MARK THIEMENS, Univ of California - San Diego, FRITZ KEILMANN, Ludwig-Maximilians-Universität and Center for Nanoscience, G.C.A.M. JANSSEN, Delft University of Technology, Netherlands, PABLO JARILLO-HERRERO, Massachusetts Institute of Technology, MICHAEL FOGLER, D.N. BASOV, Univ of California - San Diego — Using infrared nano-imaging and nano-spectroscopy, we report on the tunable hyperbolic response in heterostructures comprised of a monolayer graphene deposited on hexagonal boron nitride (G-hBN). Electrostatic gating of the top graphene layer allows for modification of the wavelength and intensity of hyperbolic phonon polaritons in bulk hBN. When compared with the pristine hBN polaritons, the graphene modified ones exhibit a longer wavelength in the Type II hyperbolic region and shorter wavelength in the Type I region. Because of this modification, we achieve a 90% increase of the propagation length for Type II polaritons in hBN. The physical origin of the modification is attributed to plasmon-phonon coupling in the G-hBN heterostructure. Our work provides a comprehensive study of plasmon-phonon coupling in a hyperbolic medium with the exploration of graphene's potential for modification of collective modes in other materials.

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