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Emission and propagation of hyperbolic phonon polaritons in hexagonal boron nitride SIYUAN DAI, University of California, San Diego, QIONG MA, YAFANG YANG, Massachusetts Institute of Technology, JEREMY ROSENFELD, MICHAEL GOLDFLAM, ALEX MCLEOD, University of California, San Diego, TROND ANDERSEN, Massachusetts Institute of Technology, ZHE FEI, MENGKUN LIU, ZHIYUAN SUN, YINMING SHAO, University of California, San Diego, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science, Japan, MARK THIEMENS, University of California, San Diego, FRITZ KEILMANN, Ludwig-Maximilians-Universitt and Center for Nanoscience, PABLO JARILLO-HERRERO, Massachusetts Institute of Technology, MICHAEL FOGLER, D. N. BASOV, University of California, San Diego — Using scattering-type scanning near-field optical microscope (s-SNOM), we studied various kinds of emission and propagation of hyperbolic phonon polaritons (HP2s) in hexagonal boron nitride (hBN). The systematic study via real-space nano-imaging reveals the emission mechanisms and propagating properties of HP2s excited by crystal edges, artificial structures, surface defects and impurities. Compared with traditional s-SNOM tip emitter, the polaritons from new emitters reported in this work possess longer propagation length and can be artificially manipulated on the hBN surface. Our work may benefit the future applications and engineering of HP2s using convenient emitters which are analogous to collective modes in other materials.

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