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Nano-imaging and nano-spectroscopy of tunable surface phonon polaritons in hexagonal boron nitride SIYUAN DAI, ZHE FEI, Univ of California - San Diego, QIONG MA, Massachusetts Institute of Technology, ALEKSANDR RODIN, Boston University, MARTIN WAGNER, ALEXANDER MCLEOD, MENGKUN LIU, Univ of California - San Diego, WILL GANNETT, WILLIAM REGAN, Univ of California - Berkeley, MARK THIEMENS, Univ of California - San Diego, GERARDO DOMINGUEZ, California State Univ - San Marcos, ANTONIO CASTRO NETO, National University of Singapore, ALEX ZETTL, Univ of California - Berkeley, FRITZ KEILMANN, Ludwig-Maximilians-Universität and Center for Nanoscience, PABLO JARILLO-HERRERO, Massachusetts Institute of Technology, MICHAEL FOGLER, DIMITRI BASOV, Univ of California - San Diego — Van der Waals crystals such as graphene, topological insulators, cuprate high-temperature superconductors, and many other layered structures reveal a rich variety of enigmatic electronic, photonic and magnetic properties. We report infrared (IR) nano-imaging of surface phonon polaritons in a prototypical van-der-Waals crystal: hexagonal boron nitride (hBN). In the setting of an antenna-based IR spectroscopic nanoscope, we accomplished launching, detecting, and real space imaging of the polaritonic waves. We were able to alter both the wavelength and the amplitude of such waves by varying the number of crystal layers in our specimens. We demonstrated a new nano-photonics method for mapping the polariton dispersion. The dispersion is shown to be governed by the crystal thickness according to a scaling law that persists down to a few monolayers. Our results point to novel functionalities of van-der-Waals crystals as reconfigurable nano-photonic materials.

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