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Nano-plasmonic phenomena in graphene nanoribbons ZHE FEI, Iowa State University, MICHAEL GOLDFLAM, JHIH-SHENG WU, SIYUAN DAI, MARTIN WAGNER, ALEX MCLEOD, University of California, San Diego, MENGKUN LIU, Stony Brook University, KIRK POST, University of California, San Diego, SHOU-EN ZHU, GUIDO JANSSEN, Delft University of Technology, MICHAEL FOGLER, DIMITRI BASOV, University of California, San Diego — We report on infrared nano-imaging studies of confined plasmon modes inside patterned graphene nanoribbons. The confined geometry of these ribbons leads to distinct mode patterns and strong field enhancement, both of which evolve systematically with the ribbon width and excitation laser frequency. In addition, broadband nano-imaging in a wide mid-infrared region allowed us to evaluate in real space the effect of the plasmon-phonon coupling. Our data and modeling show that the plasmon damping rate increases significantly when approaching the substrate phonon. Furthermore, we observed one-dimensional edge plasmons that propagate strictly along the edges of our patterned graphene nanostructures. These edge modes appear to have a relatively shorter wavelength compared to two-dimensional plasmons.

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