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THz Plasmonics of Quasi-freestanding Bilayer Epitaxial Graphene via H-intercalation KEVIN DANIELS, NRC postdoc residing at US Naval Research Laboratory, ANTHONY BOYD, ASEE postdoc residing at US Naval Research Laboratory, ANINDYA NATH, U.S. Naval Research Laboratory, MOHAMMAD JADIDI, ANDREI SUSHKOV, DENNIS DREW, University of Maryland, RACHAEL MYERS-WARD, KURT GASKILL, U.S. Naval Research Laboratory — Graphene plasmonics has attracted attention as a suitable platform for tunable THz optoelectronics. THz plasmonic resonances in conventional large-area graphene, however, suffer from low quality factor (Q) because of high carrier scattering rate. This low Q is attributed to charge carrier induced scattering and lower carrier mobility caused by the partially covalent bonding between the silicon carbide (SiC) substrate and the $6\sqrt{3}$ buffer layer between the substrate and EG. Improving the Q of plasmons makes stronger THz resonance effects and also enable THz optoelectronics with fine tunability in frequency via gating. EG on Si-face, semi-insulating 6H-SiC was intercalated in-situ by hydrogen (H_2), releasing the buffer layer from SiC forming quasi-freestanding bilayer graphene. H-intercalation time was varied from 0 – 75 minutes and structural, electrical and optical properties were explored, revealing at long H-intercalation durations high carrier mobility (3000-4000 cm^2/Vs) and high sheet carrier concentration (1E13 cm^{-2}) independent of carrier mobility. Far IR simultaneous transmission/reflection measurements revealed a narrow frequency response with line widths (γ) smaller in H-intercalated EG ($30cm^{-1}$) than observed in pristine EG ($>100cm^{-1}$) consistent with the improved mobility.

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