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Graphene Field-Effect Transistors with Gigahertz-Frequency Power Gain on Flexible Substrates NICHOLAS PETRONE, INANC MERIC, KENNETH SHEPARD, JAMES HONE, Columbia University — The development of flexible electronics operating at radio-frequencies (RF) requires materials which combine excellent electronic performance and the ability to withstand high levels of strain. Graphene's unique electronic and mechanical properties make it a promising material for the fabrication of field-effect transistors (FETs) which require both high flexibility and high operating frequencies. Furthermore, large-area films of graphene which display excellent electronic properties, crucial for the commercial realization of graphene-based devices, can be synthesized facilely by chemical vapor deposition (CVD). We utilize CVD graphene to fabricate graphene FETs (GFETs) on flexible substrates. Our GFETs demonstrate unity-current-gain frequencies, f_T, and unity-power-gain frequencies, f_{max}, up to 10.7 and 3.7 GHz, respectively, with strain limits of 1.75%. These devices represent the only reported technology to achieve gigahertz-frequency power gain at strain levels above 0.5%. As such, they demonstrate the potential for CVD graphene to enable a broad range of flexible electronic technologies which require both high-flexibility and RF operation.

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