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PECVD silicon nitride gate dielectrics and band-gap engineering in graphene devices WENJUAN ZHU, DEBORAH NEUMAYER, VASILII PEREBEINOS, PHAEDON AVOURIS, IBM - T.J. Watson Research Center — We found that silicon nitride can provide excellent coverage of graphene in field-effect transistors while preserving its good carrier mobilities, without the need of a seed layer. Moreover, the silicon nitride film has the advantage of higher dielectric constant and higher surface polar optical phonon energy (i.e. less remote phonon scattering in the graphene channel) compared to silicon oxide. The breakdown strength in silicon nitride is high as well. The effect of a perpendicular electric field on the band-structure of different numbers of graphene layers used as channels of the transistor was also studied and the induced band-gap or band-overlap was obtained accounting for the effects of the variation of the surface potential near the Dirac/neutrality point.

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