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Growth of wrinkle-free graphene on texture-controlled Platinum thin films and thermal-assisted transfer of patterned graphene

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We report the growth of wrinkle-free, strictly uniform monolayer graphene films by chemical vapor deposition on a Pt substrate with texture-controlled giant grains and the thermal-assisted transfer of large-scale patterned graphene onto arbitrary substrates. The designed Pt surfaces with limited numbers of grain boundaries and improved surface perfectness as well as small lattice constant and thermal expansion coefficient differences to graphene provide a venue for uniform growth of monolayer graphene with wrinkle-free characteristic. The thermal-assisted transfer technique allows the complete transfer of large-scale patterned graphene films onto arbitrary substrates without any ripples, tears or folds and the Pt substrates can be reused repeatedly. The transferred graphene shows high crystalline quality with an average carrier mobility of $\sim 5,500 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$ at room temperature. Furthermore, this transfer technique shows a high tolerance to variations in types and morphologies of underlying substrates, which is essential for the various applications proposed for graphene.

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