# Passivated-CVD-Graphene Based Gas Sensors Against Atmospheric Doping
# (大気ドーピング回避のためパッシベーションしたCVDグラフェンガスセンサ)

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Atmospheric doping of CVD graphene, largely limits the high sensitivity gas sensing demonstrations of CVD graphene based gas sensors to inert environments such as Argon,[1] although actual commercial applications require such demonstrations in atmospheric air. Consequently, this dichotomy between the currently achievable CVD-graphene sensor performance and the industrial requirements for gas sensing renders most reports on CVD-graphene based gas sensing of limited real-world significance.

In this work, we demonstrate the *in-situ* lithographic functionalization of CVD graphene, to yield activated carbon functionalized graphene. The similar work-function between the activated carbon[2] and graphene ensures the intrinsic properties of the CVD-graphene are maintained. Consequently, ambipolar characteristics is observed with good carrier mobility. As shown in Figure 1a, while the pristine graphene (device schematic shown in inset) demonstrated huge doping in atmospheric air just after 1 minute of exposure, the activated carbon-graphene hybrid (a-CGH) sensor, Figure 1b, (device schematic shown in inset) showed minimal doping in atmospheric air even after 40 minutes of exposure. Furthermore, we show that the pores in the a-CGH sensor, allows for the permeation of gases to the underlying graphene. Consequently, the sensor successfully detects various gases even in atmospheric air.

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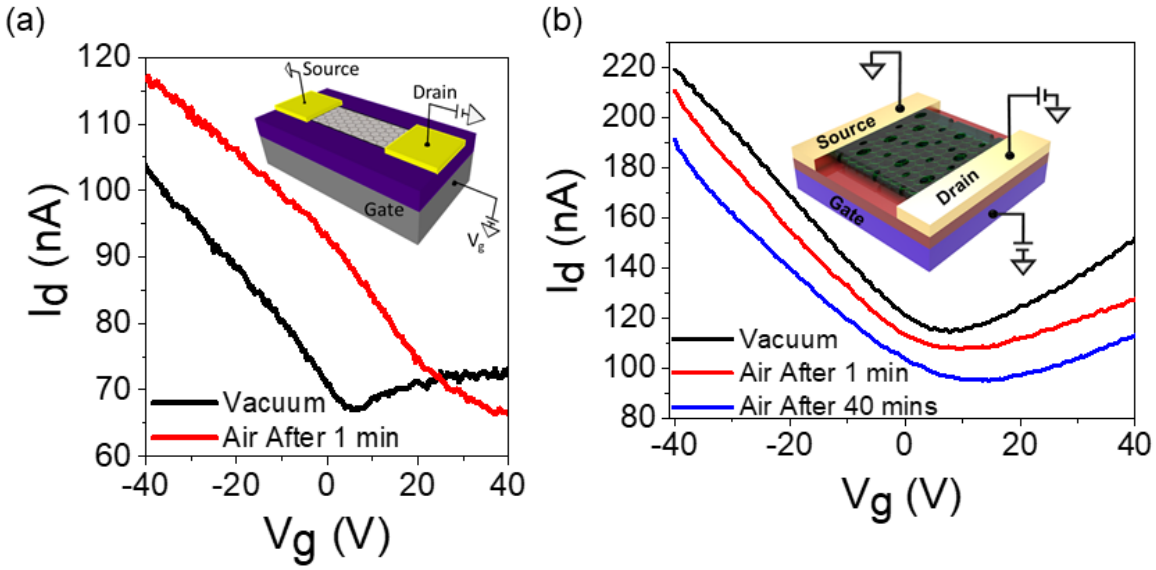


**Fig.1** Atmospheric doping response of CVD-graphene based sensors. (a) Un-functionalized CVD-graphene. (b) Porous activated carbon functionalized graphene showing minimal atmospheric air doping even after 40 minutes of exposure.

**Reference:**

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