Abstract

The electric field effect in graphite or graphene can be observed by the change of the resistivity ($\rho$) and the hole resistance ($R_H$) by the gate voltage ($V_g$). Since the resistivity and carrier density of graphene vary with gate voltage, graphene can be used as the channel layer of a field effect transistor (FET). Studies have been conducted on the application of electrolyte gates to make high carrier densities because by increasing the carrier density of graphene by the gate voltage can improve the electrical properties of graphene.

In this study, the field effect transistor with a single layer of graphene as a channel layer was compared and evaluated in the case of a general gate structure with SiO$_2$ insulating layer and the case of using an electrolyte as a gate. The graphene was formed by a typical CVD method, transferred to a SiO$_2$/Si substrate, and a gold pattern electrode was deposited to measure electrical characteristics. The change in resistivity at a lower gate voltage was confirmed when using an electrolyte gate, compared to a typical gate structure with a SiO$_2$ insulator layer, which means that the increase in carrier concentration of graphene is much more advantageous for the electrolyte gate.