## PC1-2-INV

# Superconductivity and Electronic structure in Ca-intercalated Graphene

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Through the enormous research focused on graphene since 2004, introducing superconductivity in graphene has grown into an attractive issue of research. To date, manipulation of stacking or intercalation of guest metal has been demonstrated to turn graphene into a superconductor by significant electronic band structures such as flat band(FB) or interlayer band(ILB). When the bilayer graphene is twisted each other by 1.1°, a FB is created by the band folding due to the moiré superlattice potential. Recently, it was shown that the superconductivity was driven by controlling FB at the Fermi level by field effect[1]. On the other hand, intercalation of an alkali or alkaline earth metal into graphene is believed to give ILB-driven superconductivity because they promote the occupation of the ILB, which is a criterion of the superconductivity in graphite intercalation compounds[2]. However, there was no specific evidence of superconductivity in graphene by intercalation because of difficulties in synthesizing high-quality samples and high reactivity of metal-intercalated graphene in the air.
Our group overcame these difficulties by the combination of the molecular beam epitaxy and the *in situ* 4-point-probe conductivity measurements under ultrahigh vacuum. In this paper, the author shows the electric transport properties of the Ca- and Li-intercalated bilayer-graphene on 6H-SiC(0001) substrates[3]. While the Ca-intercalated bilayer graphene exhibited the superconducting transition with $T_c^{onset}$ of 4 K, pristine and Li-intercalated bilayer graphene did not show superconductivity down to 0.8 K, as shown in the Figure. These experimental results are explained by the occupation-criterion of ILB, as seen in their electronic structure observed by the angle-resolved photoemission spectroscopy[4] and theory[5]. The author will also report on the recent progress about Ca-intercalation into monolayer graphene.

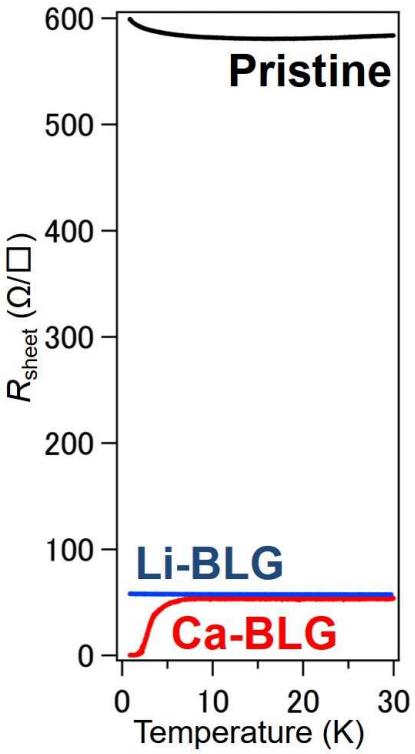


Fig. Temperature dependence of sheet resistances $R_{sheet}$ for pristine(black), Li-(blue) and Ca-(red)intercalated bilayer graphene under zero magnetic field.

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