Raman studies of graphene on different functionalized silicon surfaces

Maisarah B.A. Razak, Ariff Y. B. Zulkaffli and Md. Zakir Hossain

Advanced Engineering Research Team, Advanced Scientific Research Leaders Development Unit, Gunma University, Kiryu-City, Gunma, Japan

E-mail: missara.razak@gmail.com

Graphene is a material with unique physical and electrical properties [1]. A wide range of applications are anticipated for graphene [2]. In order to use graphene with its full potential, it is important to integrate graphene on a supporting substrate. Practical graphene devices require a supporting substrate that has the least interaction with graphene, and will not be disabling many of graphene’s extreme electronic properties [3].

Recently studies on graphene-silicon system is receiving much attention because it is believed that integration of graphene on silicon might be very promising for graphene based electronics [4, 5]. Most of these studies are focused on the transferred graphene on oxidized silicon and hydrogen terminated silicon surfaces [4]. Here we have studied the interaction of graphene on different functionalized silicon, such as hydrogen, chlorine and methyl terminated surfaces. Graphene was transferred on functionalized silicon surfaces by various techniques such as scotch tape micro mechanical cleavage, drop casting and chemical processes. While the functionalized Si(111) surfaces are characterized by x-ray photoelectron spectroscopy (XPS), the interaction between graphene and functionalized silicon surfaces are analyzed by Raman spectroscopy. The G and 2D bands of graphene are found to be blue shifted (~20 cm^{-1}) in the case of H-terminated surface. This blue shift of the bands indicates that graphene has the least interaction with H-terminated surfaces compared to that of chlorine and methyl terminated silicon. The detailed results obtained for different types of transferred process will be discussed.