Supporting Information

Role of anions in Au complex for doping and degradation of graphene

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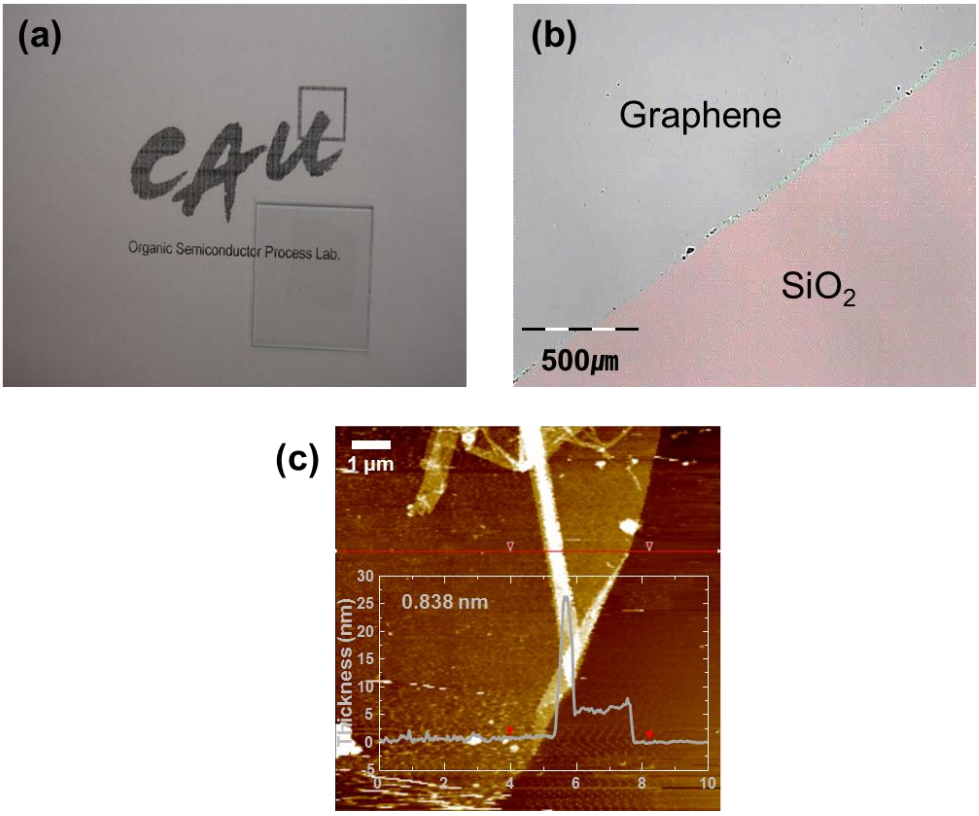

Figure SI1. a) The photographic image of pristine graphene on a glass substrate. b) The optical microscopic image of transferred pristine graphene on SiO_2 wafer. c) The thickness profile and AFM image of pristine graphene on SiO_2 wafer. The thickness of the few-layer graphene was 0.838 nm, indicating that 2 or 3 layers of graphene were synthesized.

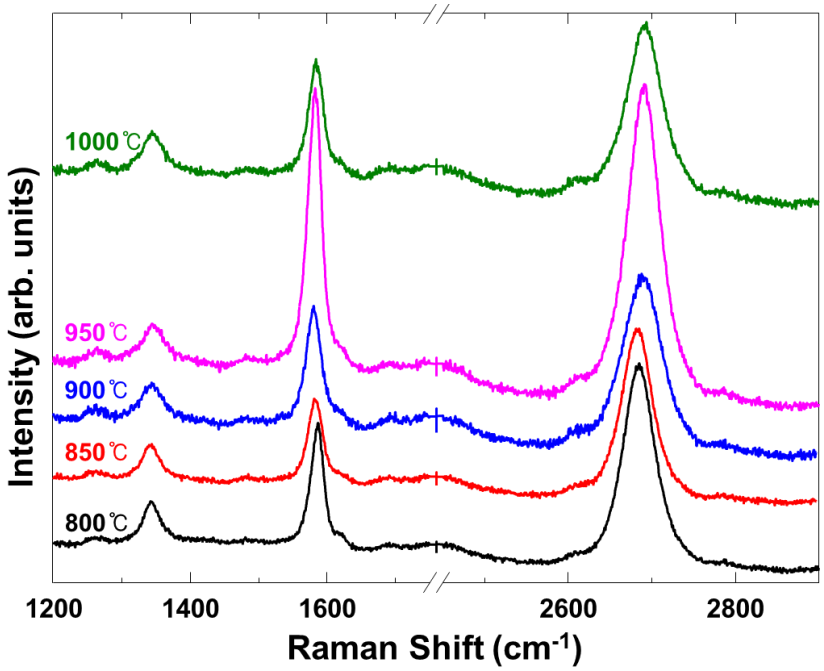

Figure SI2. The Raman spectroscopy of transferrred pristine graphene sheets as a function of growth temperature. The gas ratio of CH_4 of H_2 was fixed at 6:1. The G peak around 1550 cm^{-1} and 2D peak around 2700 cm^{-1} was due to the in-plane bond-stretching motion of the sp^2-bonded carbon atoms and the monolayer graphene, respectively. The D peak around 1360 cm^{-1} is absent in perfect graphite and indicates the presence of disorders and defects. The 950°C growth graphene had the highest I_G/I_D value and the acceptable value of I_{2D}/I_D for few-layer graphene sheets indicating that this was the best condition for few-layer graphene growth.

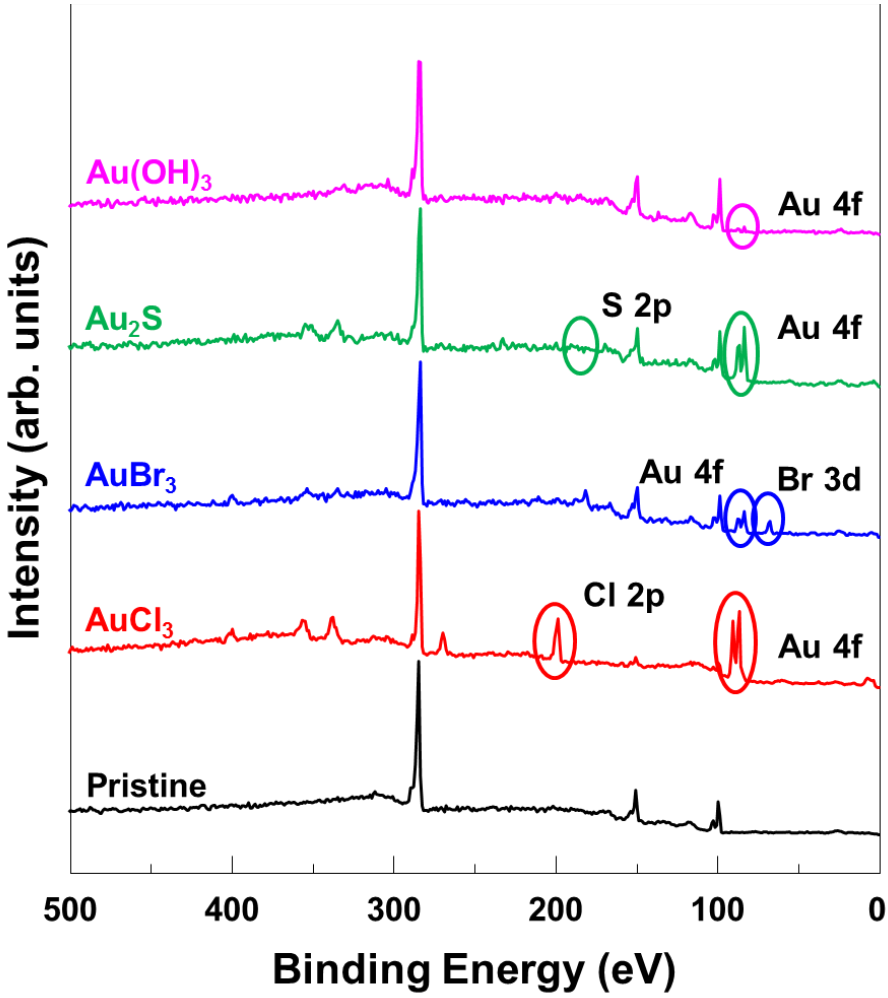

Figure SI3. The wide scan of the Au complex doped graphene sheets. Each Au complex doped graphene sheet had anions peak for Cl 2p, Br 3d, S 2p. The Au 4f peak indicated the presence of gold ions on the graphene sheets.

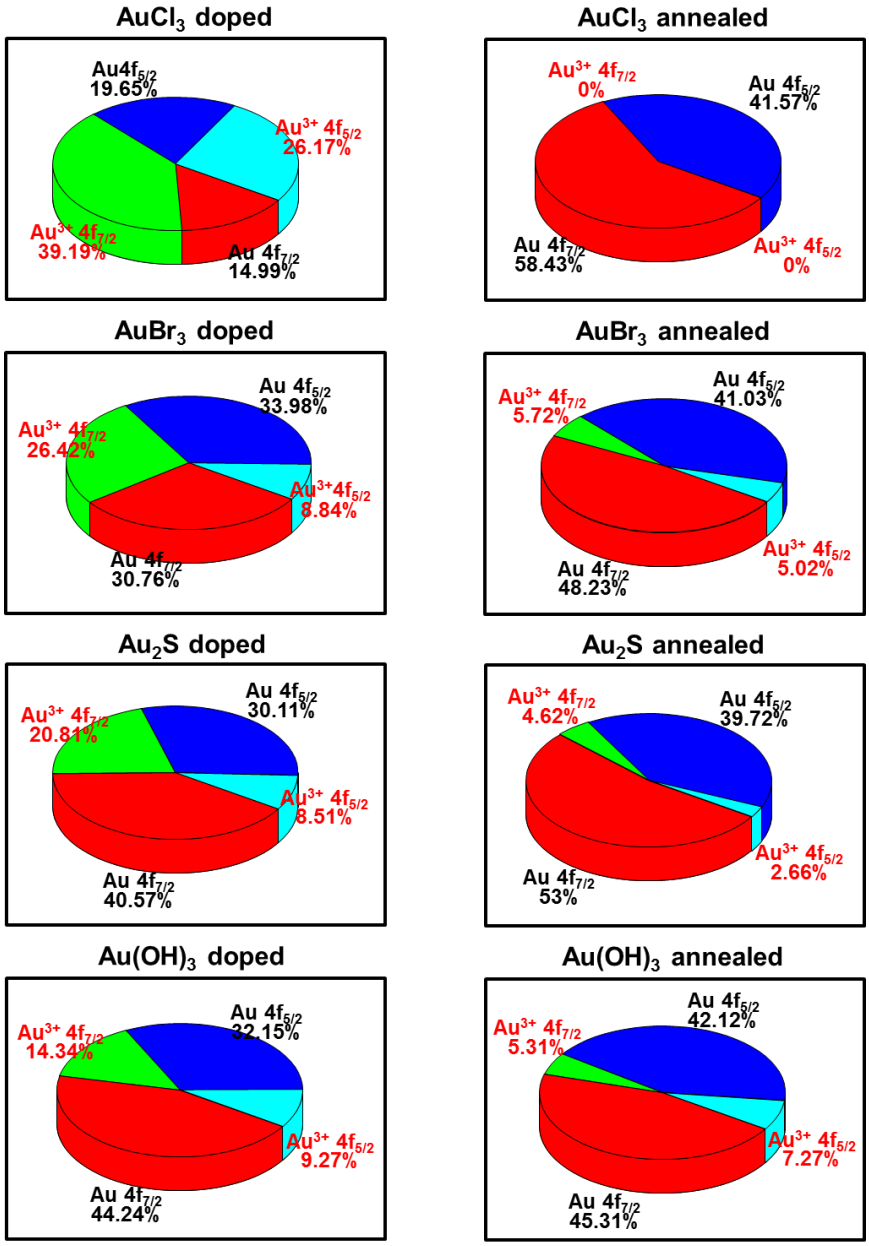

Figure SI4. The Au 4f peak separtion was investigated. In the case of the Au complex doped graphene, the $AuCl_3$ had the largest ion peak, which was related to the degree of the decrease in the sheet resistance. But annealed $AuCl_3$ doped graphene sheet contained no gold ion peaks, indicating that they were completely degraded by thermal annealing.

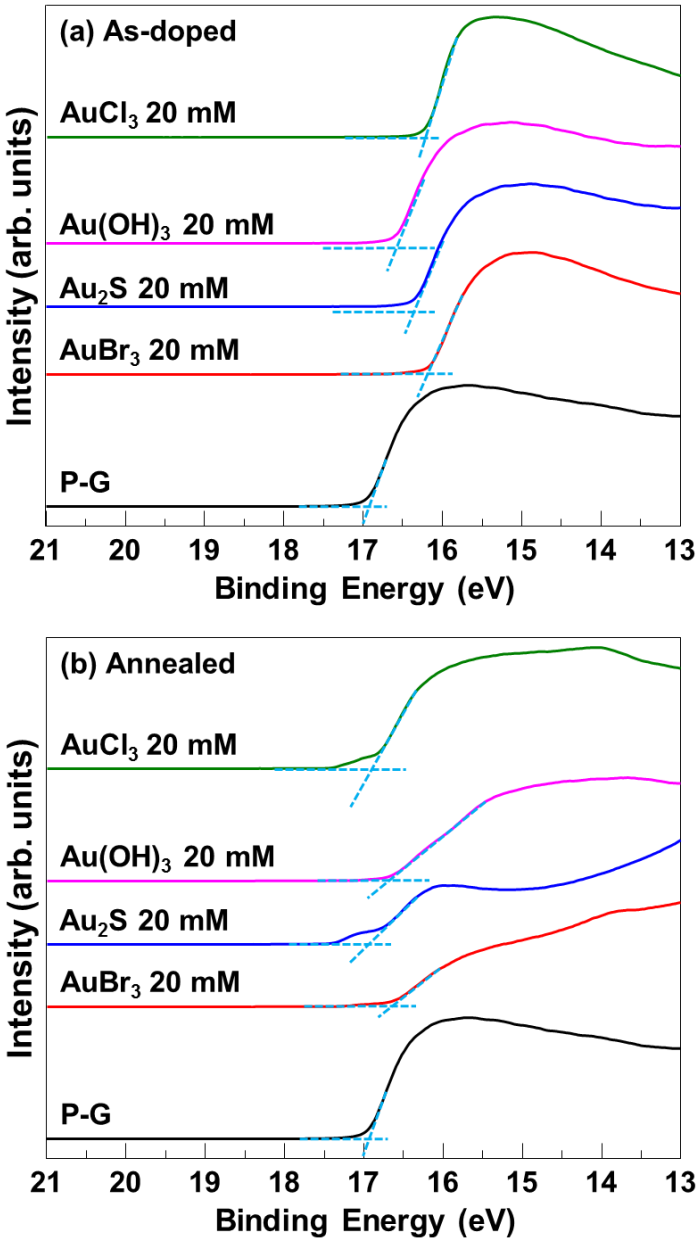

Figure SI5. The UPS speectra shows the secondary electron threshold energy differences. The $AuBr_3$ doped graphene sheets had the lowest secondary electron threshold energy value, indicating that they have the highest work function value. But the annealed graphene sheets had a larger secondary electron threshold energy value than that of each doped graphene sheets. The $AuCl_3$ doped graphene had the largest variance among the Au complex doped graphene sheets.