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Selective patterning of graphene surface by oxidation and chemical modification using conductive AFM manipulation

We investigated the oxidation condition of graphene surface using electrochemical method with conductive atomic force microscope (AFM) and studied its application for selective patterning. We prepared the devices with locally oxidized graphene using micro contact transfer method and adjusted relative humidity of the surroundings before the measurement of conductive AFM. The sample bias voltage, scan speed and set point by a contact-mode were controlled for optimizing oxidation of graphene. The oxidation of graphene surface was observed by AFM topography and Raman spectroscopy.

The etching effect of oxidized graphene was observed by soaking the patterned graphene in chloroform and deionized water. The removal of oxidized area was checked by AFM topology and Raman mapping measurements. Based on above mentioned results, we will introduce our plan to estimate the mass change of oxidized graphene with a sensitivity of less than a few daltons by measuring its mechanical resonance frequency shifts.