SW-004

Deterministic manipulation and visualization of near field with ultra-smooth, super-spherical gold nanoparticles by atomic force microscopy

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As an alternative way to get sophisticated nanostructures, atomic force microscopy (AFM) has been used to directly manipulate building primitives. In particular, assembly of metallic nanoparticles(NPs) can provide various structures for making various metamolecules. As far, conventionally made polygonal shaped metallic NPs showed non-uniform distribution in size and shape which limit its study of fundamental properties and practical applications. In here, we optimized conditions for deterministic manipulation of ultra-smooth and super-spherical gold nanoparticles (AuNPs) by AFM. [1] Lowered adhesion force by using platinum-iridium coated AFM tips enabled us to push super-spherical AuNPs in linear motion to pre-programmed position. As a result, uniform and reliable electric/magnetic behaviors of assembled metamolecules were achieved which showed a good agreement with simulation data. Furthermore, visualization of near field for super-spherical AuNPs was also addressed using photosensitive azo-dye polymers. Since the photosensitive azo-dye polymers can directly record the intensity of electric field, optical near field can be mapped without complicated instrumental setup. [2] By controlling embedding depth of AuNPs, we studied electric field of AuNPs in different configuration. .

[1] Minwoo Kim et al., Optics Express. Vol. 23, No.10 (2015).
[2] Christophe Hubert et al., NanoLett. Vol. 5, No.4 (2005).

SW-005

Study of the Carrier Injection Barrier by Tuning Graphene Electrode Work Function for Organic Light Emitting Diodes OLED 일함수 변화를 통한 그래핀 전극의 배리어 튜닝하기

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Typical electrodes (metal or indium tin oxide (ITO)), which were used in conventional organic light emitting devices (OLEDs) structure, have transparency and conductivity, but, it is not suitable as the electrode of the flexible OLEDs (f-OLEDs) due to its brittle property. Although Graphene is the most well-known alternative material for conventional electrode because of present electrode properties as well as flexibility, its carrier injection barrier is comparatively high to use as electrode. In this work, we performed plasma treatment on the graphene surface and alkali metal doping in the organic materials to study for its possibility as anode and cathode, respectively. By using Ultraviolet Photoemission Spectroscopy (UPS), we investigated the interfaces of modified graphene. The plasma treatment is generated by various gas types such as O2 and Ar, to increase the work function of the graphene film. Also, for co-deposition of organic film to do alkali metal doping, we used three different organic materials which are BMPYPB (1,3-Bis(3,5-di-pyrid-3-yl-phenyl)benzene), TMPYPB (1,3,5-Tri[(3-pyridyl)-phen-3-yl]benzene), and 3TPYMB (Tris(2,4,6-trimethyl-3-(pyridin-3-yl)phenyl)borane)). They are well known for ETL materials in OLEDs. From these results, we found that graphene work function can be tuned to overcome the weakness of graphene induced carrier injection barrier, when the interface was treated with plasma (alkali metal) through the value of hole (electron) injection barrier is reduced about 1 eV.