Organic light-emitting diode based on graphene electrode modified with transition metal oxides and light emission induced by scanning tunneling microscope at molecular scale

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In the first part of presentation, we will show our investigation of graphene modified with transition metal oxides (TMO) aim to design and build a new type of transparent conducting electrode for organic light-emitting diode (OLED) application, as alternative to standard indium tin oxide (ITO) electrode. We show that pristine graphene shows work function which does not guarantee energy level alignment required for efficient OLED. To overcome this problem, we modify work function of graphene on transparent substrates (SiC, quarz), by covering it with thin layers of thermally evaporated rhenium oxide. The deposition of rhenium oxide leads predominantly to the formation of Re_2O_7/graphene heterostructure, exhibiting an increased work function in comparison with that of the pristine graphene [1]. Additionally, we present our OLED consisting of anode made from Re_2O_7/graphene heterostructure treated as a Hole Injection Layer. Light Emitting Layer is prepared based on well-known thermal deposited layer of tris-(8-hydroxyquinoline)aluminum(III) (Alq3).

In the second part of presentation, we will show light emission investigation of helicene molecules adsorbed on Au(111), Cu(001), and NiAl(110) surfaces induced by a scanning tunneling microscope (STM). We show that the suppression of plasmon light emission over the helicene molecules is observed on Au(111) and Cu(001) surfaces. While, the enhancement of light emission above the molecular clusters formed on metallic NiAl(110) is revealed, suggesting plasmon-enhanced molecular light emission. What is more, the formation of self-assembled zigzagged twin rows of helicene molecules are observed on Au(111), while cluster formation on Cu(001), and NiAl(110) surfaces. STM images show self-assembled zigzagged twin rows of helicene molecules on Au(111) consisting of alternating (M)- and (P)-enantiomers [2].

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