FROM ORGANOMETALLIC STRUCTURES TO GRAPHENE NANORIBBONS: DI0042ROMO-PYRENE ON Ag(110)

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In this talk I will discuss our recent results on the formation of low dimensional graphene nanostructures on Ag(110) [1]. By a combination of scanning tunneling microscopy, spectroscopic techniques and density functional theory calculations, we demonstrate the formation of extended, chiral patterns of parallel graphene nanoribbons (GNR) by surface assisted Ullmann coupling and de-hydrogenation [2] of 1,6-dibromo-pyrene. The so-formed polymers are monodispersed in width and show alternated zig-zag and armchair sites at the edges. It's well known that graphene is a material of exceptional properties, but its intrinsic zero-energy gap reduces the impact for applications in nanoelectronics. On the contrary, GNRs narrower than 10 nm are semiconductors, due to the electron confinement in one dimension and to edge effects [3]. The ability to grow highly ordered nano-ribbons is therefore of relevance for possible applications in nanodevices. Besides that, our result demonstrates the peculiarity of pyrene derivatives for the formation of GNRs on coinage metals, in particular on Ag(110). These results open the possibility of engineering nanostructures of particular shape and dimension (and hence with tailored electronic properties) by choosing suitable molecular precursors. This is further demonstrated by preliminary results on Br-Corannulene self-assembly on the same substrate.

Keywords: Graphene nanoribbons; surface assisted polymerization; dibromo-pyrene Ullman coupling; STM; photoemission spectroscopy; DFT

References

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