Atmospheric contaminants on graphitic surfaces and drive amplitude modulation

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Kelvin probe force microscopy images show that the surface potential of graphite changes with time as the contamination covers its surface. Using mass spectrometry we identify the molecular mass of the contaminants to be compatible with that of tetracene, a polycyclic aromatic hydrocarbon (PAH), and its isomers. A combination of desorption and Kelvin probe force microscopy experiments using drive amplitude modulation plus theoretical calculations confirms that these molecules are the main contaminant for graphitic surfaces in air ambient conditions. Interestingly, when the sample temperature is increased above $\sim$50 ^{o}C the molecules are desorbed and the surface potential becomes fairly homogeneous, suggesting that graphitic surfaces should be almost atomically clean above this temperature. PAHs are potent atmospheric pollutants, potentially carcinogenic, that consist of fused aromatic rings. Incomplete combustion of organic materials can increase the concentration of PAHs in the atmosphere, which in urban regions is enough to totally cover the surface of graphite in a time period that varies from minutes to a few hours. One of the consequences of the adsorption of molecules on graphene is the doping of its surface and the variation of the charge neutrality point originated by the charge transfer between graphene and the contamination layer.