Probing molecular layers with low-energy electrons

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Propositions

accompanying the dissertation

"Probing Molecular Layers with Low-Energy Electrons"

By

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1. Surface cleanliness is the most important factor in the growth of molecular layers, as well as a non-trivial issue. *(Chapter 3 of this thesis)*
2. Due to their higher damage resistance to low energy electrons, use of aromatic compounds as resists could increase the resolution of (e-beam) lithography by excluding the bulk of secondary electrons from the exposure process. *(Chapter 4 of this thesis)*
3. LEEM electron reflectivity spectra are an indispensable tool for correct analysis of photoemission experiments. *(Chapter 5 of this thesis)*
4. Unoccupied electronic states above the vacuum level are the biggest factor in the energy distribution of secondary electrons, because influences (and information) from other electronic properties of the sample mostly get smeared out as a result of multiple collisions before electron emission.
   (Chapter 5 of this Thesis)
5. A gradual change in the orientation of pentacene molecules as a pentacene film on hexagonal boron-nitride gets thicker, as proposed by B. Park *et. al.* is not substantiated by any experimental evidence.
   ACS Appl. Mater. Interfaces 9, 27839 (2017)
6. The information provided by High-Resolution Electron Energy Loss Spectroscopy (HREELS) about individual chemical bond types is invaluable for understanding beam damage mechanisms in molecules.
   L. Amiaud, et. al., Phys. Chem. Chem. Phys. 16, 1050 (2014), J. Houplin et. al., Phys. Chem. Chem. Phys. 17, 30721 (2015), J. Houplin et. al., Langmuir 31, 13528 (2015)

7. The conduction band in the unoccupied electronic band structure of thin-film phase pentacene is actually centred at 3 eV above the vacuum level, not at 2 eV as suggested by H. Fukagawa *et. al.*
   Phys. Rev. B 73, 245310 (2006)
8. Inverse photoelectron emission spectra are generally expected to show a notable degree of dependence on the energy of the incident electrons, and the results by W. Han *et. al.* on pentacene films showing negligible dependence are mostly due to the small range of electron energies investigated and cannot be generalized.
   Appl. Phys. Lett. 103, 123303, (2013)
9. In scientific experiments, as well as many other endeavours, it is not possible to know how close we are to results until they have actually been materialized.
10. Ease of operation for regular use should be one of the most important design considerations in instrument development, next to scientific requirements. *(Chapter 7 of this thesis)*