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## Low-temperature spectroscopic studies of single molecules in 3-D and on 2-D hosts

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# Stellingen

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## Low-temperature spectroscopic studies of single molecules in 3-D and on 2-D hosts

1. Of all narrow molecule emitters, perylene is the best candidate for experiments on narrow resonances to the triplet state (Chapter 2,3 and 6 of this thesis).
2. Without knowledge of the particular alignment of a molecule in a crystal, electric fields cannot be mapped reliably by the Stark shift induced on the molecule (Chapter 4 of this thesis).
3. The efficiency of migration of triplet excitons to guest molecules relies critically on the purity of the host material (Chapter 3 of this thesis).
4. Organic contamination is the most likely source of two-level systems detected through spectral jumps in the fluorescence from molecules on hBN (Chapter 5 of this thesis).
5. The immobilization of molecules on hBN cannot be merely governed by van der Waals interactions with defect-free hBN (Chapter 5 of this thesis).
6. The use of boron nitride nanotubes could solve the problems that arise during encapsulation of molecules by flat hBN layers [*Allard et al., Advanced Materials 32, 2001429 (2020)*].
7. Many studies in the literature on presumed hBN defects are rather studies of organic molecules protected by hBN, formed during 'activation' steps through thermal annealing [*Neumann et al., ACS Nano 17, 11679-11691 (2023)*].
8. The best way to identify an unknown molecule, such as "molecule X", is through scanning tunneling microscopy combined with fluorescence [*Imada et al., Science 373, 95-98 (2021)*].
9. Experimental science is expensive. More transparency and (loaned) sharing of materials and equipment on a European level could improve accessibility of expensive experimental research.

Robert Smit  
Leiden, 12 Juni 2024