

University of Groningen

Low-dimensional solution-processable electronics

Talsma, Wytse

DOI:
[10.33612/diss.182730251](https://doi.org/10.33612/diss.182730251)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2021

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Talsma, W. (2021). *Low-dimensional solution-processable electronics: from field-effect transistor to artificial synapse*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen.
<https://doi.org/10.33612/diss.182730251>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Propositions

accompanying the dissertation

LOW-DIMENSIONAL SOLUTION-PROCESSABLE ELECTRONICS

From field-effect transistor to artificial synapse

by

Wytse Talsma

05-11-2021

1. The use of o-xylene instead of toluene as applicator solvent not only dramatically improves s-SWCNT ink shelf lifetimes, but also reproducibility and field-effect transistor performances. (Chapter 2)
2. Clever engineering on the nanoscale can reduce hysteresis; Inserting a small conjugated vinyl group into the head-to-head bithiophenes in the conjugated polymers PNDITEG-TVT and PNDIC8TEG-TVT can increase their backbone planarity and lower their bandgap, all without significantly sacrificing the wrapping ability. When used as wrapping polymer for s-SWCNT, this results in a reduced FET hysteresis, indicating a lower injection barrier. (Chapter 3)
3. Key factor in achieving high performance in Sn-based perovskite transistors is to reduce the p-doping level of the 3D perovskite by adding a tiny amount of 2D R-P phase, which significantly improves the crystallinity and orientation of the FASnI₃. (Chapter 4)
4. Simple real-time square-shape pulses applied on two distinct electrodes can induce anti-Hebbian behavior in s-SWCNT transistors, imitating synapse functionality. (Chapter 5)
5. Performing science is much similar to building a house. A strong foundation is required for further development.
6. Field-effect transistors are great tools for assessing semiconducting ink quality.

7. Combining the personal skills and techniques of individual researchers working on seemingly unrelated topics unlocks potential and can result in outstanding achievements.
8. Pushing buttons is not science.
9. Allow your feelings; it allows for great thinking. In turn, this can lead to novel results.
10. Huge disadvantages can be exploited to become advantageous, or even an essential pre-requirement, for new materials and concepts.
11. The key to a proper break is the ability to fully disconnect from business-as-usual, both mentally and physically. This includes all methods of communication. Only then, a mind can be fully re-freshed.
12. Pursuing a PhD is also about moving on from a seemingly fruitless project then, appreciating the very idea being realized by others, and swallowing the regret with a scoop of tear.

These propositions are considered defensible and as such have been approved by the promotor Prof. M. A. Loi.