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Molecular charge transport : relating orbital structures to the conductance properties

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Citation

Guédon, C. M. (2012, November 6). *Molecular charge transport : relating orbital structures to the conductance properties*. *Casimir PhD Series*. Retrieved from <https://hdl.handle.net/1887/20093>

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Cover Page



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Author: Guédon, Constant Marcel

Title: Molecular charge transport : relating orbital structures to the conductance properties

Issue Date: 2012-11-06

MOLECULAR CHARGE TRANSPORT

Relating orbital structures to the conductance properties

MOLECULAR CHARGE TRANSPORT

Relating orbital structures to the conductance properties

Proefschrift

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van Rector Magnificus prof. mr. P. F. van der Heijden,
volgens besluit van het College voor Promoties
te verdedigen op dinsdag 6 november 2012
klokke 15:00 uur

door

Constant Marcel GUÉDON

geboren te Den Haag
in 1979

Promotiecommissie

Promotor:	Prof. dr. J. M. van Ruitenbeek	Universiteit Leiden
Copromotor:	Dr. ir. S. J. van der Molen	Universiteit Leiden
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	Prof. Dr. M. van Hecke	Universiteit Leiden

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Casimir PhD Series, Delft-Leiden 2012-30

ISBN 978-90-8593-136-2

An electronic version of this dissertation is available at

<http://www.physics.leidenuniv.nl/sections/cm/amc/>.

Printed by: Gildeprint Drukkerijen

Front & Back: Constant Guédon

L^AT_EX template: Jos Seldenthuis

Voor Lucas

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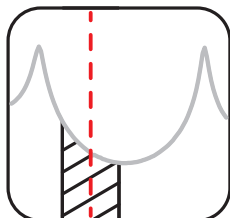
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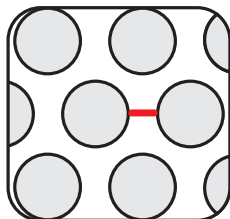
THESIS OUTLINE

Chapter 1 (p. 1) Basic concepts.



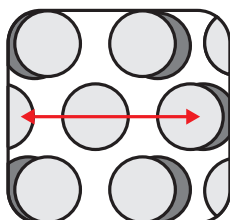
In this chapter we present the basic concepts of molecular charge transport. We also introduce the most common measurement methodologies.

Chapter 2 (p. 23) 2D nanoparticle networks for molecular electronics

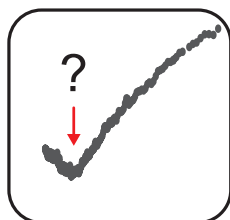


In this chapter we introduce a new approach to molecular charge transport. We make use of a 2D nanoparticle network to connect the molecules, with the nanoparticles acting as miniature electrodes. This technique allows for additional optical measurements on the devices.

Chapter 3 (p. 59) Nanoparticle array based strain sensor.



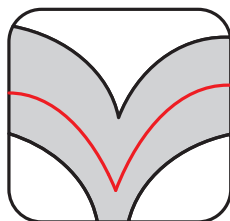
Here, we combine mechanically controlled break junctions and 2D nanoparticle networks to create a robust platform for molecular charge transport measurements with control over the interelectrode distance on the picometer scale. The resistance change due to bending of our structures is dependent on the molecular species present between the nanoparticles.

Chapter 4 (p. 71)**Interpretation of transition voltage spectroscopy.**

The promise of 'transition voltage spectroscopy' (TVS) is that the position of molecular levels can be determined in molecular devices without applying extreme voltages. Here, we consider the physics behind TVS in more detail. Moreover we perform experiments to explore the use of TVS in molecular junctions and simple tunnel junctions.

Chapter 5 (p. 95)**Conductance properties of a series of OPE molecules.**

In this chapter we introduce a technique to contact self-assembled monolayers of molecules using an atomic force microscope. We demonstrate the validity and the versatility of this technique. Moreover we introduce a novel plotting method to visualize our results in a statistically sound manner.

Chapter 6 (p. 119)**Evidence for quantum interference in molecular charge transport.**

In this chapter we present conductance measurements on a series of molecules with various conjugation patterns. For the cross-conjugated molecules we present direct evidence for destructive interferences. This work has been done in collaboration with Hennie Valkenier and Cees Hummelen (University of Groningen) and with Troels Markussen and Kristian Thygesen (Danish Technical University)

