Molecular charge transport : relating orbital structures to the conductance properties

Guédon, C.M.

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
Overige leden:	Prof. Dr. E. R. Eliel	Universiteit Leiden
	Prof. Dr. B. Doudin	Université de Strasbourg
	Dr. ir. C. F. J. Flipse	Technische Universiteit Eindhoven
	Prof. Dr. ir. H. S. J. van der Zant	Technische Universiteit Delft
	Prof. Dr. M. van Hecke	Universiteit Leiden

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

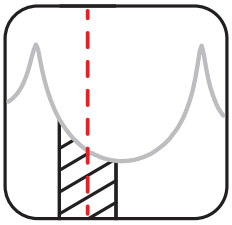
LaTeX template: Jos Seldenthuis

Voor Lucas

Contents

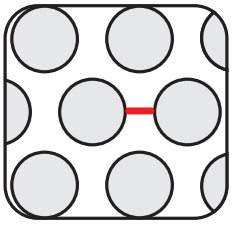
Thesis Outline

Chapter 1 (p. 1)
Basic concepts.



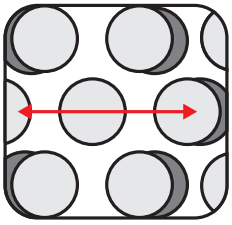
In this chapter we present the basic concepts of molecular charge transport. We also introduce the most common measurement methodologies.

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.