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## Stable single molecules for quantum optics and all-optical switches

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## Curriculum Vitae

of Pedro Navarro Pérez, born in México City on the 23<sup>rd</sup> November 1982.

In 2008, Pedro Navarro graduated from the National Autonomous University of Mexico (UNAM) upon receiving his BSc diploma in Chemistry. His thesis was entitled “*Synthesis of useful chromophores to study energy transfer processes*”. He then enrolled in the MSc program in Physical Chemistry at the same University. In 2009 he received his MSc diploma upon completion of the thesis “*Femto-second studies of internal conversion rates of poly-aromatic hydrocarbons in solution*”. During his MSc studies he was a teaching assistant for a theoretical and practical course in organic synthesis.

In September 2010, he joined the MoNOS group at Leiden University as a PhD candidate under supervision of Prof. dr M. Orrit. In his research project he studied the optical and spectroscopic properties of well-known fluorescent molecules at room and cryogenic temperatures embedded in different solids. By carefully analyzing the fluorescence excitation spectra of isolated single molecules, he studied the nanometer-scale inhomogeneities in the immediate surroundings of the fluorescent molecules. He discovered new systems in which single molecules can be spectrally isolated and studied over extended times. Moreover, he used one of these systems to demonstrate the coupling between a macroscopic mechanical oscillator and a single molecule. He did an internship in the group of Prof. dr S. Tautz, at the Peter Grünberg Institut (PGI-3), Forschungszentrum Jülich, Germany to perform experiments on electron energy-loss spectroscopy of vacuum-deposited terylene films under ultra-high vacuum conditions. During his time in Leiden he assisted Dr M. Huber three times with the course “Introduction to Quantum Chemistry”, which is part of the BSc program “Life science and technology” at Leiden University.

Soon he will join the group of Prof. J. Peón at UNAM in Mexico City, to develop a new family of photo-activatable dyes that may be used for a variety of optical super-resolution techniques such as STORM, *d*STORM, PALM and SOFI.



## List of Publications

- J. Zugazagoitia, M. Maya, C. D. Zea, P. Navarro, H.I. Beltrán and J. Peon: “Excited-state dynamics and two-photon absorption cross sections of fluorescent diphenyl-tin(IV) derivatives with schiff bases: a comparative study of the effect of chelation from the ultrafast to the steady-state time scale”. *J. Phys. Chem. A* **2010** 114, 704–714.
- Y. Tian, P. Navarro, B. Kozankiewicz and M. Orrit: “Spectral Diffusion of Single Dibenzo-terrylene Molecules in 2,3-Dimethylanthracene”. *ChemPhysChem* **2012** 13, 3510 – 3515.
- W. Rodríguez-Córdoba, R. Noria-Moreno, P. Navarro and J. Peon: “Ultrafast fluorescence study of the effect of carboxylic and carboxylate substituents on the excited state properties of anthracene”. *Journal of Luminescence* **2014** 145, 697-707.
- P. Navarro, Y. Tian, M. van Stee and M. Orrit: “Stable Single-Molecule Lines of Terrylene in Polycrystalline para-Dichlorobenzene at 1.5 K”. *ChemPhysChem* **2014** 15, 3032-3039.
- Y. Tian, P. Navarro and M. Orrit: “A Single Molecule as a Local Acoustic Detector for Mechanical Oscillators”. *Phys. Rev. Lett.* **2014**. 113, 135505.
- P. Navarro, F.C. Bocquet, I. Deperasinska, G. Pirug, F. S. Tautz and M. Orrit. “Electron energy loss of terrylene deposited on Au (111): Vibrational and electronic spectroscopy”. *J. Phys. Chem. C*, accepted for publication.



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Although the cover of this thesis bears my name only, many people have contributed to the work described in this thesis. There are also people who have contributed to my life in the Netherlands; I gladly acknowledge their contributions here.

During the four years in Leiden, I have seen many people come and go. Even though I cannot name them all, I hope they know that I have not forgotten them.

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I would like to thank my supervisor Prof. Dr. Michel Orrit, who invited me to the Netherlands to study single molecules; without him I would never have come to Leiden. Michel, it was a pleasure to work with you! I wish to thank all the members of my family, especially my mom and dad, Pilar and Pedro, my brother Pablo and my uncle Amaury. Also, I would like to thank my good Dutch friends who helped me to fit into the daily life in the Netherlands. Special thanks to the International Student Network in Leiden. Thanks also to all the Mexican friends for sharing with me more than friendship; to all my German friends for their splendid kindness; to the Spanish group for the fruitful discussions and Dutch friends who were around me during the 4 years. And to all of you who read this lines, thanks.

