
Self-Assembled Single-Molecule Electronic Systems

Kasper Moth-Poulsen^{*†}

¹Department of Chemistry and Chemical Engineering (Chalmers) – Chalmers University of Technology
SE-412 96 Gothenburg, Sweden

Abstract

Recent years have seen progress in several areas regarding single molecule electronic devices. A number of interesting structure–property relationships have been observed, including vibronic effects, spin transitions, and molecular electronic interference known as quantum interference. Together, these observations highlight what the rich opportunities in molecular design might bring in terms of advanced device properties.[1] Pertinent challenges in the field of are related to development of high yield preparative procedures for fabrication of single molecule devices in a parallel and reproducible way. With these two lectures we introduce methods for realisation of single molecule electronic devices and discuss how the field can move forward in terms of developing methods for parallel fabrication of multiple single molecule electronics devices. We discuss methods for the formation of the nanogaps as well as methods attempting to achieve single molecule functionality in each individual device.[2] Examples include fabrication of single molecule devices by in-situ growth of gold nanorods,[3] formation of nanogaps via deterministic self assembly of gold nanorods,[4] In the second lecture we will discuss various means of integrating advanced molecular function such as molecular switches into single molecule electronic devices.

A) T.A. Gschneidtner, Y. A. Diaz Fernandez and K. Moth-Poulsen *J. Mater. Chem. C*, **2013**,1, 7127-7133. B) Y. Diaz Fernandez, L. Sun, T. A. Gschneidtner, K. Moth-Poulsen, *APL Materials* 2, 010702, **2014**. C) L. Sun, Y. A. Diaz-Fernandez, T. A. Gschneidtner, F. Westerlund, S. Lara-Avila, and K. Moth-Poulsen, *Chem. Soc. Rev.* 43 (21), 7378 - 7411, **2014**.

Melissa R. Dewi, Tina A. Gschneidtner, Sait Elmas, Michael Ranford, Kasper Moth-Poulsen, and Thomas Nann. *ACS Nano* 9 (2), 1434–1439, **2015**.

Jain, T., Lara-Avila, S., Kervennic, Y.-V., Moth-Poulsen, K., Nørgaard, K., Kubatkin, S., Bjørnholm, T. *ACS Nano*, 6 (5), 3861–3867, **2012**.

A. Rey, G. Billardon, E. L'ortscher, K. Moth-Poulsen, N. Stuhr-Hansen, H. Wolf, T. Bjørnholm, A. Stemmer and H. Riel, *Nanoscale*, 5, 8680-8688, **2013**.

*Speaker

†Corresponding author: kasper.moth-poulsen@chalmers.se