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# Covalent coupling on surfaces in UHV

André Gourdon

The NanoSciences Group, CEMES, CNRS, Toulouse, France

On-surface covalent coupling of organic precursors to form 0D, 1D, or 2D stable molecules has revealed in the past five years as a potentially powerful way of synthesizing molecular devices difficult or impossible to prepare in solution. So far, this technique has been limited to metallic surfaces or 1ML insulating films on metal, and has allowed for instance to obtain 1D and 2D porphyrin oligomers, nanographene ribbons, polymeric Fe-phthalocyanine single layers and so on.<sup>1,2</sup> . Taking into account the recent results in this field, it is now possible to propose coupling mechanisms, and to discuss the potential and limitations of this strategy. For molecular electronics or molecular optics applications, extension of this on-surface coupling technique is also a major objective. We have recently demonstrated<sup>3,4</sup> that, by employing the strong electrostatic interactions between the carboxylate groups of halide-substituted benzoic acids and calcite surfaces, it was possible to reach homolytic cleavage temperatures. This allows for the formation of aryl radicals and intermolecular coupling. By varying the number and position of halide groups, we have obtained linear or zig-zag oligomers.



Oligomers obtained by coupling of 3,5-diiodosalicylic acid (left) and 2,5-diiodobenzoic acid on calcite

#### **References:**

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  Covalent Networks through on-Surface Chemistry in Ultra-High Vacuum: State-of-the-Art and Recent
- 2 Covalent Networks through on-Surface Chemistry in Ultra-High Vacuum: State-of-the-Art and R Developments, **Phys. Chem. Chem. Phys.** (2011), 13, 14283–14292, G. Franc & A. Gourdon
- *3 Direct Visualization of Molecule Deprotonation on an Insulating Surface,* **ACS Nano** (2012) 6 (8), 7406–7411, M. Kittelmann, P. Rahe, A. Gourdon, A. Kühnle
- 4 On-Surface Covalent Linking of Organic Building Blocks on a Bulk Insulator, ACS Nano (2011) ASAP, DOI: 10.1021/nn2033192, M. Kittelmann et al.

#### **Curriculum vitae**

#### **GOURDON** André

Group leader NanoSciences Group CEMES CNRS UP 8011 BP 4347 29 Rue Jeanne Marvig 31055 Toulouse CEDEX 04 France Tel: (33) 5 62 25 78 59 Fax: (33)5 62 25 79 99 E-mail: andre.gourdon@cemes.fr Web: www.cemes.fr/GNS

#### Education

Engineer E.N.S.C.P., Paris 1975 D.E.A. Spectrochemistry and Structure, (1976) Univ. P. & M. Curie, (Paris VI) PhD Chemistry (1978) Univ. P. & M. Curie, (Paris VI) PhD Physical Sciences (Doctorat d'Etat) (1986) Univ. P. & M. Curie, (Paris VI)

### Experience

Research Assistant, S.R.C. 1980-1981, Inorganic Chemistry Laboratory (Oxford) Research assistant CNRS, 1981-1989, Transition Metals Chemistry Laboratory, Univ. P & M. Curie (Paris)

Research Director (1999) CEMES (Toulouse)

#### Management

Leader of the CEMES NanoSciences Group –CNRS- Toulouse - France Coordinator of the European project ARTIST (Alternative Routes Towards Information Storage and Transport at the atomic and molecular scale (2010-2013) Coordinator of the European project CHIC (Consortium for Hamiltonian Intramolecular Computing) 2002-2006 Co-coordinator of the German-French project "Single Molecule Synthesis", VolkswagenStiftung, 2002-2006 President of the Scientific Council of the "Laboratoire d'Excellence" NEXT (6 laboratories, 186 permanent researchers, 89 engineer/technicians, 160 phD/post-docs).

#### Research

Conception, design and synthesis of molecular devices for Scanning Probe Microscopy experiments at the single molecule level.

## Publications -125 published – h-factor : 33;

Full list of publications: http://www.researcherid.com/rid/C-9799-2009