

# Groupe Femtophysique Moléculaire aux Interfaces

## Membres du groupe :

### 4 chercheurs et enseignants-chercheurs permanents :

Bernard Bourguignon, Serge Carrez, Aimeric Ouvrard, Wanquan Zheng

4 post-doctorants : Natalia Alyabyeva (2016-2018), Aimeric Ouvrard (2007-2009), Matthias Büchner (1995-1996), Mihaela Stoica, (1992-1993)

10 doctorants : Mohamad Ammoun (2015-2019), Abdoul-Mouize Zakaria (2015-2018), Rudy Desmarchelier (2011-2014), Jijin Wang (2009-2013), Emilie Bulard (2009-2012), Ahmed Ghalgaoui (2008-2012), Ziang Guo (2006-2010), Frédéric Fournier (2000-2003), Serge Carrez (1994-1997), Bogdan Dragnea (1994-1997)

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## Publications du groupe (1996-2018)

*Probing the Nanoparticle Geometry of Nanoparticles down to sub-nanometer size by Microscopy and Vibrational Spectroscopy.*

Alyabyeva, N., Ouvrard, A., Zakaria, A.-M., and Bourguignon, B.

**Soumis à Phys. Rev. Lett. (2018)**

*Identification of Active Sites in Oxidation Reaction from Real-Time Probing of Adsorbate Motion over Pd Nanoparticles.*

Ghalgaoui, A., Horchani, R., Wang, J., Ouvrard, A., Carrez, S., and Bourguignon, B.

**J. Phys. Chem. Lett. (2018)** 9 (18), 5202–5206 ([DOI: 10.1021/acs.jpcclett.8b02215](https://doi.org/10.1021/acs.jpcclett.8b02215))

*Transition from disordered to long-range ordered nanoparticles on Al<sub>2</sub>O<sub>3</sub>/Ni<sub>3</sub>Al(111).*

Alyabyeva, N., Ouvrard, A., Zakaria, A.-M., Charra, F., and Bourguignon, B.

**Appl. Surf. Sci. (2018)** 444 (30), 423-429 ([DOI: 10.1016/j.apsusc.2018.03.025](https://doi.org/10.1016/j.apsusc.2018.03.025))

*Pulse Shaping in Surface Science.*

Bourguignon B.

**In: Wandelt, K., (Ed.) Encyclopedia of Interfacial Chemistry: Surface Science and Electrochemistry**, vol. 2, 604–610.

Elsevier (2018). ([DOI: 10.1016/B978-0-12-409547-2.13280-9](https://doi.org/10.1016/B978-0-12-409547-2.13280-9))

*Electron to Adsorbate Energy Transfer in Nanoparticles: Adsorption Site, Size, and Support Matter.*

Ghalgaoui, A., Ouvrard, A., Wang, J., Carrez, S., Zheng, W., and Bourguignon, B.

**J. Phys. Chem. Lett. (2017)** 8 (12), 2666–2671. ([DOI: 10.1021/acs.jpcclett.7b00698](https://doi.org/10.1021/acs.jpcclett.7b00698))

*CO Chemisorption on Ultrathin MgO-Supported Palladium Nanoparticles.*

Ouvrard, A., Ghalgaoui, A., Michel, C., Barth, C., Wang, J., Carrez, S., Zheng, W., Henry, C. R., and Bourguignon, B.

**J. Phys. Chem. C (2017)** 121 (10), 5551–5564. ([DOI: 10.1021/acs.jpcc.6b10595](https://doi.org/10.1021/acs.jpcc.6b10595))

*CO Adsorption on Pd(100) Revisited by Sum Frequency Generation: Evidence for Two Adsorption Sites in the Compression Stage.*

Ouvrard, A., Wang, J., Ghalgaoui, A., Nave, S., Carrez, S., Zheng, W., Dubost, H., and Bourguignon, B.

**J. of Phys. Chem. C (2014)** 118 (34), 19688–19700 ([DOI: 10.1021/jp500912p](https://doi.org/10.1021/jp500912p))

*Effect of visible pulse shaping on the accuracy of relative intensity measurements in BBSFG vibrational spectroscopy.*

Wang, J., Dubost, H., Ghalgaoui, A., Zheng, W., Carrez, S., Ouvrard, A., and Bourguignon, B.

**Surf. Sci. (2014)** 626, 26–39. ([DOI: 10.1016/j.susc.2014.03.017](https://doi.org/10.1016/j.susc.2014.03.017))

*Competition of Bovine Serum Albumin Adsorption and Bacterial Adhesion onto Surface-Grafted ODT: In Situ Study by Vibrational SFG and Fluorescence Confocal Microscopy.*

Bulard, E., Fontaine-Aupart, M.-P., Dubost, H., Zheng, W., Bellon-Fontaine, M.-N., Herry, J.-M. and Bourguignon, B.

**Langmuir (2012)** 28, 17001–17010 ([DOI: 10.1021/la302976u](https://doi.org/10.1021/la302976u))

*The effect of bacterial adhesion on grafted chains revealed by the non-invasive Sum Frequency Generation (SFG) spectroscopy.*

E. Bulard, M.-P. Fontaine-Aupart, H. Dubost, W. Zheng, J.-M. Herry, M.-N. Bellon-Fontaine, R. Briandet, B. Bourguignon

**Spectroscopy: An International Journal (2012)** 27, 571 ([DOI: 10.1155/2012/682591](https://doi.org/10.1155/2012/682591))

*Non-invasive SFG spectroscopy: a tool to reveal the conformational change of grafted chains due to bacterial adhesion.*  
E. Bulard, H. Dubost, M.-P. Fontaine-Aupart, W. Zheng, J.-M. Herry, M.-N. Bellon-Fontaine, R. Briandet, B. Bourguignon, *Clinical and Biomedical Spectroscopy and Imaging II*, edited by Nirmala Ramanujam, Jürgen Popp  
**Proc. of SPIE-OSA Biomedical Optics**, SPIE Vol. 8087 (2011) 80870C ([DOI: 10.1117/12.888786](https://doi.org/10.1117/12.888786))

*Non-invasive vibrational SFG spectroscopy reveals that bacterial adhesion can alter the conformation of grafted "brush" chains on SAM.*  
Bulard, E., Guo, Z., Zheng, W., Dubost, H., Fontaine-Aupart, M.-P., Bellon-Fontaine, M.-N., Herry, J.-M., Briandet, R. and Bourguignon, B.  
**Langmuir** (2011) 27, 4928–4935 ([DOI: 10.1021/la200205e](https://doi.org/10.1021/la200205e))

*Characterization of Thin MgO Films on Ag(001) by Low-Energy Electron Diffraction and Scanning Tunneling Microscopy.*  
Ouvrard, A., Niebauer, J., Ghalgaoui, A. Barth, C., Henry, C.R., and Bourguignon, B.  
**J. Phys. Chem. C** (2011) 115 (16), 8034–8041 ([DOI: 10.1021/jp1095823](https://doi.org/10.1021/jp1095823))

*Deriving the complete molecular conformation of self-assembled alkanethiol molecules from sum-frequency generation vibrational spectra.*  
Bourguignon, B., Zheng, W., Carrez, S., Ouvrard, A., Fournier, A., Dubost, H.  
**Phys. Rev. B** (2009) 79, 125433 ([DOI: 10.1103/PhysRevB.79.125433](https://doi.org/10.1103/PhysRevB.79.125433))

*On the chain length dependence of CH<sub>3</sub> vibrational mode relative intensities in sum frequency generation spectra of self-assembled alkanethiols.*  
Guo, Z., Zheng, W., Hamoudi, H., Dablemont, C., Esaulov, V.A., and Bourguignon, B.  
**Surf. Sci.** (2008) 602, 3551 ([DOI: 10.1016/j.susc.2008.09.029](https://doi.org/10.1016/j.susc.2008.09.029))

*On the self-assembly of short chain alkanedithiols.*  
Hamoudi, H., Guo, Z., Prato, M., Dablemont, C., Zheng, W., Bourguignon, B., Canepa, M., and Esaulov, V.A.  
**Phys. Chem. Chem. Phys.** (2008) 10, 6836 ([DOI: 10.1039/B809760G](https://doi.org/10.1039/B809760G))

*Interaction of coadsorbed CH<sub>3</sub>Cl and D<sub>2</sub>O layers on Pd(111) studied by sum frequency generation.*  
F. Fournier, H. Dubost, S. Carrez, W. Zheng, B. Bourguignon  
**J. Chem. Phys.** (2005) 123, 184705 ([DOI: 10.1063/1.2101566](https://doi.org/10.1063/1.2101566))

*Vibrational dynamics of adsorbed molecules under conditions of photodesorption: Pump-probe SFG spectra of CO/Pt(111).*  
Fournier, F., Zheng, W. Carrez, S., Dubost, H., and Bourguignon, B.  
**J. Chem. Phys.** (2004) 121, 4839 ([DOI: 10.1063/1.1778138](https://doi.org/10.1063/1.1778138))

*A Reply to the Comment by W. G. Roeterdink et al. on Phys. Rev. Lett.* (2004) 92, 216102  
Fournier, F., Zheng, W. Carrez, S., Dubost, H., and Bourguignon, B.  
**Phys. Rev. Lett.** (2004) 93, 249602 ([DOI: 10.1103/PhysRevLett.93.249602](https://doi.org/10.1103/PhysRevLett.93.249602))

*Ultrafast Laser Excitation of CO/Pt(111) Probed by Sum Frequency Generation: Coverage Dependent Desorption Efficiency.*  
Fournier, F., Zheng, W. Carrez, S., Dubost, H., and Bourguignon, B.  
**Phys. Rev. Lett.** (2004) 92, 216102 ([DOI: 10.1103/PhysRevLett.92.216102](https://doi.org/10.1103/PhysRevLett.92.216102))

*Time resolved ultrafast energy transfer from electrons photoexcited in Pt(111) to adsorbed CO during photodesorption.*  
F. Fournier, W. Zheng, S. Carrez, H. Dubost, B. Bourguignon  
**in : « Femtochemistry and Femtobiology : Ultrafast Events in Molecular Science »** M. Martin and J. T. Hynes, eds (Elsevier, 2004), p.533.

*A restructuring of the CO/Pt(111) surface induced by femtosecond laser pulses ?*  
F. Fournier, W. Zheng, S. Carrez, H. Dubost, B. Bourguignon  
**Surf. Sci.** 528, 177 (2003)

*On the anisotropy and CO coverage dependence of SHG from Pd(111).*  
B. Bourguignon, W. Zheng, S. Carrez, F. Fournier, M. L. Gaillard, H. Dubost  
**Surf. Sci.** 515, 567 (2002)

*Influence of adsorbates on pulsed laser melting dynamics.*  
B. Dragnea, J. Boulmer, D. Débarre and B. Bourguignon  
**Appl. Phys. A** 73, 609 (2001)

*Growth of a SiC layer on Si(100) from adsorbed Propene by laser melting.*

B. Dragnea, J. Boulmer, D. Débarre and B. Bourguignon

**J. Appl. Phys.** 90, 449 (2001)

*Photoinduced effects in UV laser melting of Si in UHV.*

B. Dragnea and B. Bourguignon

**Phys. Rev. Lett.** 82, 3085 (1999)

*Site selective probe of the desorption of CO from Pd(111) by Sum Frequency Generation and Fourier Transform IR spectroscopies : a comparison of thermal and laser desorption.*

S. Carrez, B. Dragnea, W. Q. Zheng, H. Dubost and B. Bourguignon, **Surf. Sci.** 440, 151 (1999)

*Laser desorption of C contaminated Pd clusters grown on MgO(100).*

B. Bourguignon, S. Carrez, M. Büchner and C. R. Henry

**Chem. Phys. Lett.** 287, 40 (1998)

*Vibrational spectroscopy of imperfect CO/Pd(111) surfaces obtained by adsorption between 150 and 230 K.*

B. Bourguignon, S. Carrez, B. Dragnea and H. Dubost

**Surf. Sci.** 418, 171 (1998)

*Vibrational spectroscopy at interfaces by IR - vis sum frequency generation using CLIO FEL.*

A. Peremans, A. Tadjeddine, W. Q. Zheng, P. Guyot-Sionnest, P. Remy, G. Ryschenkow, M. Buck, Y. Caudano, L.-M. Yu, P.

A. Thiry, B. Bourguignon, H. Dubost, B. Dragnea and S. Carrez

**Nucl. Instr. Meth. Phys. Res. A** 375, 657 (1996)

## Publications partenaires liées à la plateforme laser fs (2005-2018)

*Vibrational spectroscopy and dynamics of  $W(CO)_6$  in solid methane as a probe of lattice properties.*

Thon, R., Chin, W., Chamma, D., Galaup, J.-P., Ouvrard, A., Bourguignon, B., and Crépin, C.

**J. of Chem. Phys.** (2016) 145 (21), 214306 ([DOI: 10.1063/1.4968561](https://doi.org/10.1063/1.4968561))

*Parity violation in chiral structure creation under femtosecond laser irradiation in silica glass?*

Poumellec, B., Lancry, M., Desmarchelier, R., Hervé, E., and Bourguignon, B.

**Light Sci. Appl.** (2016) 5 (11), e16178 ([DOI: 10.1038/lsa.2016.178](https://doi.org/10.1038/lsa.2016.178))

*Asymmetric orientational writing dependence on polarization and direction in  $Li_2O-Nb_2O_5-SiO_2$  glass with femtosecond laser irradiation.*

Fan, C., Poumellec, B., Desmarchelier, R., Zeng, H., Bourguignon, B., Chen, G., and Lancry, M.

**Appl. Phys. B** (2014) 117 (2), 737-747 ([DOI: 10.1007/s00340-014-5889-8](https://doi.org/10.1007/s00340-014-5889-8))

*Vibrational Perturbations of  $W(CO)_6$  Trapped in a Molecular Lattice Probed by Linear and Nonlinear Spectroscopy.*

Thon, R., Chin, W., Galaup, J.-P., Ouvrard, A., Bourguignon, B., and Crepin, C.

**J. Phys. Chem. A** (2013) 117 (34), 8145–8156 ([DOI: 10.1021/jp401498e](https://doi.org/10.1021/jp401498e))

*Gold nanoparticles reshaped by ultrafast laser irradiation inside a silica-based glass, studied through optical properties*

C. Fan, B. Poumellec, H. Zeng, R. Desmarchelier, B. Bourguignon, G. Chen, M. Lancry

**J. Phys. Chem. C** (2012) 116, 2647 ([DOI: 10.1021/jp203408y](https://doi.org/10.1021/jp203408y))

*Oriented creation of anisotropic defects by IR femtosecond laser scanning in silica*

M. Lancry, B. Poumellec, R. Desmarchelier, and B. Bourguignon

**Optical Materials Express** (2012) 2, 1809-1821 ([DOI: 10.1364/OME.2.001809](https://doi.org/10.1364/OME.2.001809))

*Directional Writing Dependence of Birefringence in Multicomponent Silica-based Glasses with Ultrashort Laser Irradiation*

C. Fan, B. Poumellec, H. Zeng, M. Lancry, W. Yang, B. Bourguignon, G. Chen

**JLMN - Journal of Laser Micro/Nanoengineering** (2011) 6, 158.

*Novel Cyanoterphenyl Self-assembly Monolayers on Au(111) Studied by Ellipsometry, X-ray photoelectron spectroscopy, and vibrational spectroscopies.*

H.-L. Zhang, S. D. Evans, K. Critchley, H. Fukushima, T. Tamaki, F. Fournier, W. Zheng, S. Carrez, H. Dubost, B. Bourguignon

**J. Chem. Phys.** (2005) 122, 224707

## Publications partenaires extérieurs (2014-2018)

*Modified cantilevers to probe unambiguously out-of-plane piezoresponse.*

Alyabyeva, N., Ouvrard, A., Lindfors-Vrejoiu, I., Kolomiitsev, A., Solodovnik, M. Ageev, O., and McGrouther, D.  
**Phys. Rev. Mat.** (2018) 2, 064402 ([DOI: 10.1103/PhysRevMaterials.2.064402](https://doi.org/10.1103/PhysRevMaterials.2.064402))

*Back-scattered electron visualization of ferroelectric domains in a BiFeO<sub>3</sub> epitaxial film.*

Alyabyeva, N., Ouvrard, A., Lindfors-Vrejoiu, I., Ageev, O., and McGrouther, D.  
**Appl. Phys. Lett.** (2017) 111 (22), 222901. ([DOI: 10.1063/1.4994180](https://doi.org/10.1063/1.4994180))

*Stern-Layer Adsorption of Oligonucleotides on Lamellar Cationic Lipid Bilayer Investigated by Polarization-Resolved SFG-VS.*

Liqun Wang, Yang Shen, Yanbo Yang, Wangting Lu, Wenhui Li, Feng Wei, Guang Zheng, Youhua Zhou, Wanquan Zheng, and Yuancheng Cao  
**ACS Omega** (2017) 2, 9241 ([DOI: 10.1021/acsomega.7b01214](https://doi.org/10.1021/acsomega.7b01214))

*Shape-controlled synthesis of Pd nanocrystals in an aqueous solution by using amphiphilic triblock copolymers as both the stabilizer and the reductant.*

Wangting Lu, Geng Zhang, Feng Wei, Wenhui Li, Kun Cheng, Fei Ding, Jiying Zhang and Wanquan Zheng  
**Col. Polym. Sci.** (2017) 295, 703 ([DOI: 10.1007/s00396-017-4041-9](https://doi.org/10.1007/s00396-017-4041-9))

*Laser Linewidth and Spectral Resolution in Infrared Scanning Sum Frequency Generation Vibrational Spectroscopy System.*

Feng Wei, Wen-xiu Xia, Zhong-jin Hu, Wen-hui Li, Ji-ying Zhang, Wanquan Zheng  
**Chin. J. Chem. Phys.** (2016) 29, 171 ([DOI: 10.1063/1674-0068/29/cjcp1601001](https://doi.org/10.1063/1674-0068/29/cjcp1601001))

*Photocatalytic Reduction Synthesis of Ternary Ag Nanoparticles/Polyoxometalate/Graphene Nanohybrids and Its Activity in the Electrocatalysis of Oxygen Reduction.*

Zhaowei Xian, Rongji Liu, Hang Li, Shuangshuang Zhang, Zhihua Yang, Wanquan Zheng, Chunhua Chen, Hongbin Cao, Guangjin Zhang  
**J. Clust. Sci.** (2016) 27, 241 ([DOI: 10.1007/s10876-015-0926-2](https://doi.org/10.1007/s10876-015-0926-2))

*Investigation of defect modes with Al<sub>2</sub>O<sub>3</sub> and TiO<sub>2</sub> in one-dimensional photonic crystals* Xing Xiao, Wang Wenjuna, Li Shuhong, Zheng Wanquan, Zhang Dong, Du Qianqian, Gao Xuexi, Zhang Bingyuan.

**Optik** (2016) 127, 135 ([DOI: 10.1016/j.ijleo.2015.10.005](https://doi.org/10.1016/j.ijleo.2015.10.005))

*Electrochemical-reduction-assisted assembly of ternary Ag nanoparticles/polyoxometalate/graphene nanohybrids and their activity in the electrocatalysis of oxygen reduction.*

Rongji Liu, a Zhaowei Xian, Shuangshuang Zhang, Chunhua Chen, Zhihua Yang, Hang Li, Wanquan Zheng, Guangjin Zhang and Hongbin Cao  
**RSC Advances** (2015) 5, 74447 ([DOI: 10.1039/c5ra12556a](https://doi.org/10.1039/c5ra12556a))

*Localized Surface Plasmon-Enhanced Electroluminescence in OLEDs by Self-Assembly Ag Nanoparticle Film.*

Xiaoxiao He, Wenjun Wang, Shuhong Li, Qingru Wang, Wanquan Zheng, Qiang Shi and Yunlong Liu  
**Nanoscale Res. Lett.** (2015) 10, 468 ([DOI: 10.1186/s11671-015-1176-9](https://doi.org/10.1186/s11671-015-1176-9))

*Experimental and theoretical analysis of ZnO/Au/ZnO transparent conducting thin films.*

Xiaoxiao He, Wenjun Wang, Shuhong Li, Yunlong Liu, Wanquan Zheng, Qiang Shi and Xin Luo  
**Vacuum** (2015) 120, 17 ([DOI: 10.1016/j.vacuum.2015.06.015](https://doi.org/10.1016/j.vacuum.2015.06.015))

*Interfacial Structure and Transformation of Guanine-Rich Oligonucleotides on Solid Supported Lipid Bilayer Investigated by Sum Frequency Generation Vibrational Spectroscopy.*

Feng Wei, Kangzhen Tian and Wanquan Zheng  
**J. Phys. Chem. C** (2015) 119, 27038 ([DOI: 10.1021/acs.jpcc.5b08747](https://doi.org/10.1021/acs.jpcc.5b08747))

*Assembly and relaxation behaviours of phosphatidylethanolamine monolayers investigated by polarization and frequency resolved SFG-VS.*

Feng Wei, Wei Xiong, Wenhui Li, Wangting Lu, Heather C. Allen and Wanquan Zheng  
**Phys. Chem. Chem. Phys.** (2015) 17, 25114 ([DOI: 10.1039/c5cp03977k](https://doi.org/10.1039/c5cp03977k))

*High Efficiency Electron Transfer Layer based on Ag-Al Co-Doped ZnS in Organic Light Emission Devices.*

X. He, W. Wang, S. Li, Q. Wang, W. Zheng, Q. Shi and Y. Liu  
**ECS Solid State Letters** (2015) 4, R10-12 ([DOI: 10.1149/2.0021502ssl](https://doi.org/10.1149/2.0021502ssl))

*Surface-phase junctions of branched TiO<sub>2</sub> nanorod arrays for efficient photoelectrochemical water splitting.*  
Jiao Liu, Xuelian Yu, Qingya Liu, Rongji Liu, Xinke Shang, Shuangshuang Zhang, Wenhui Li, Wanquan Zheng, Guangjin Zhang, Hongbin Cao, Zhanjun Gu  
**Applied Catalysis B: Environmental** (2014), 296, 158-159 ([DOI: 10.1016/j.apcatb.2014.04.032](https://doi.org/10.1016/j.apcatb.2014.04.032))