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1995 HDR, Habilitation in Science, University Paris 7 (16/5/1995)
1988 PhD of Physical Organic Chemistry, University Paris 7 (22/1/1988)

• Over 200 articles • 2 edited books • 19 book chapters • 2 patents • 1 invited Gordon Conference • Over 100 oral and poster presentations • Supervision of PhD students: **17** • Over 4000 citations • H-index: 33.

• Honorary Medal from the Polymer Institute (Slovak Academy of Sciences, Slovakia) for long term international collaboration on surface and interface aspects of polypyrrole nanocomposites (2008).

PRESENT MAIN RESERACH PROJECTS

(i) Aryl diazonium as coupling agents of polymers and for surface initiated polymerization.
(ii) Electrochemical sensors based on molecularly imprinted polymer thin films.
(iii) Conductive polymer coatings for the development of flexible gas sensors.
(iv) Films, powders, latex particles and nanocomposites of conductive polymers.
(v) Clay/polymer and CNT/polymer nanocomposites.

SELECTED PUBLICATIONS RELEVANT TO THE SURFACE CHEMISTRY OF DIAZONIUM SALTS

1. *Aryl diazonium salts: a new class of coupling agents for bonding polymers, biomacromolecules and nanoparticles to surfaces. REVIEW.* S. Mahouche-Chergui, S. Gam-Derouich, C. Mangeney, M. M. Chehimi. Chemical Society Reviews, 40 (2011) 4143–4166.
2. *Grafting polymer–protein bioconjugate to boron-doped diamond using aryl diazonium coupling agents.* Z. Salmi, A. Lamouri, P. Decorse, M. Jouini, A. Boussadi, J. Achard, A. Gicquel, S. Mahouche-Chergui, B. Carbonnier, M. M. Chehimi. Diamond & Related Materials, 40 (2013) 60–68.
3. *Diazonium cation-exchanged clay: an efficient, unfrequented route for making clay/polymer nanocomposites.* Z. Salmi, K. Benzarti, M. M. Chehimi. Langmuir, 29 (2013) 13323–13328.
4. *Core/shell, protuberance-free MWCNT/polyaniline nanocomposites via interfacial chemistry of aryl diazonium salts.* A. Mekki, S. Samanta, A. Singh, Z. Salmi, R. Mahmoud, M. M. Chehimi, D. K. Aswal. Journal of Colloid and Interface Science, 418 (2014) 185–192.
5. *Design of molecularly imprinted polymer grafts with embedded gold nanoparticles through the interfacial chemistry of aryl diazonium salts. S. Gam-Derouich, S. Mahouche-Chergui, S. Truong, D. Ben Hassen-Chehimi, M. M. Chehimi.* Polymer, 52 (2011) 4463-4470.
6. *Hairy carbon nanotube@nano Pd heterostructures: Design, characterization and application in Suzuki C-C coupling reaction*. S. Mahouche Chergui, A. Ledebt, F. Mammeri, F. Herbst, B. Carbonnier, H. Ben Romdhane, M. Delamar, M. M. Chehimi. Langmuir, 26 (2010) 16115-16121.

EDITED BOOKS

1. *Aryl diazonium salts : new coupling agents in polymer and surface science*. M. M. Chehimi (Ed.), Wiley-VCH, Weinheim (Germany), 2012, ISBN978-3-527-32998-4.
2. *Applied surface chemistry of nanomaterials* . M. M. Chehimi and J. Pinson (Eds.), Nova Science Publishers, Hauppauge (NY, USA), 2013, ISBN: 978-1-62808-351-4.

SURFACE CHEMISTRY OF ARYL DIAZONIUM SALTS. HISTORICAL DEVELOPMENT AND APPLICATIONS IN POLYMER SCIENCE AND ENGINEERING

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The discovery of diazotation of compounds by the German chemist Peter Griess dates back to 1858. Henceforth, aryl diazonium salts are commonly used for the synthesis of a large series of organic compounds such as azo dyes which are industrially produced. However, the study of the surface chemistry of these salts remained sparse despite its interest in modifying materials such as liquid mercury electrodes [1] or to label enzymes [2].

In 1992, Jean Pinson and co-workers described the mechanisms of the reaction between aryl diazonium salts and glassy carbon electrodes and demonstrated by XPS the existence of surface-tethered aryl groups [3]. Provided that the functional group, in para position of the diazonium, is reactive, it becomes possible to graft polymers, enzymes, catalysts, etc. Since then, the literature witnessed a quantum jump in the number of publications pertaining to the surface chemistry of aryl diazonium salts and uses thereof. The interest in using these compounds obviously lies in their ease of preparation, rapid reduction by a large range of methods and strong aryl-surface covalent bonding. The applications concern polymer coatings, molecular electronics, electrocatalysis, (bio)sensors, to name but a few, as testified by over 4000 articles [4] and one edited book [5]. Several surface processes using diazonium salts were also patented and industrial products, though not too many, are on the market (modified carbon black [6] and drug eluting stents [7]).

These extraordinary academic and industrial achievements will be summarized first, then the emphasis will be on polymer grafting to aryl diazonium-modified materials surfaces. Grafting can be achieved either *via* click chemistry or *via* a range of surface-initiated polymerization methods (radical, iniferter, anionic) on sp^2 and sp^3 carbons, metals, ceramics, clay and semi-conductors. The applications concern catalytic hybrid nanomaterials, molecularly imprinted polymer-based sensors and bioactive surfaces.

From the above, the toolbox of the polymer chemist is enriched with aryl diazonium salts which undoubtedly represent alternative coupling agents to the traditional silanes and thiols for tethering polymers to surfaces.

References

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[3] M. Delamar, R. Hitmi, J. Pinson, and J. M. Savéant, *J. Am. Chem. Soc.*, 1992, *114*, 5883
[4] (a) J. Pinson, F. Podvorica, *Chem. Soc. Rev.*, 2005, *34*, 429 / (b) D. Bélanger, J. Pinson, *Chem. Soc. Rev.* 2011, *40*, 3995 / (c) S. Mahouche-Chergui, S. Gam-Derouich, C. Mangeney, M. M. Chehimi, *Chem. Soc. Rev.* 2011, *40*, 4143.
[5] *Aryl Diazonium Salts: New Coupling Agents in Polymer and Surface Science*, M. M. Chehimi (Ed.), © 2012 Wiley-VCH Verlag, Weinheim, Germany.
[6] http://www.cabot-corp.com/Research-and-Development/Particle-Design-For-Performance/Surface-Modification/GN200811251337PM2192/
[7] http://www.youtube.com/watch?v=cRPPhFWsyqI