



2018

ANNUAL
REPORT 2019

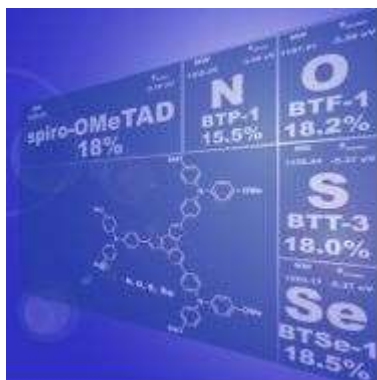
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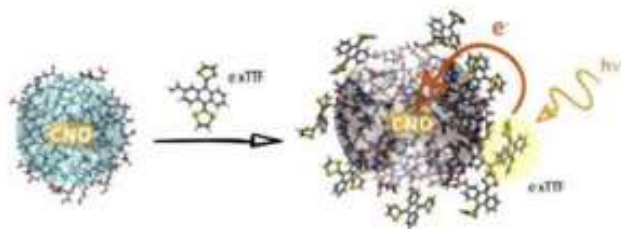
<http://www.nazariomartingroup.com/index.html>

1) I. García-Benito, I. Zimmermann, J. Urieta-Mora, J. Aragón, J. Calbo, J. Perles, A. Serrano, A. Molina-Ontoria, E. Ortí, N. Martín, M. K. Nazeeruddin. "Heteroatom Effect on Star-shaped Hole-Transporting Materials for Perovskite Solar Cells" *Adv. Funct. Mater.*, **2018**, 1801734 - DOI: 10.1002/adfm.201801734.

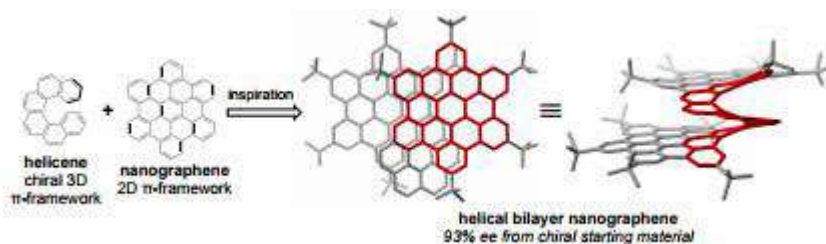


Three new star-shaped hole-transporting materials (HTMs) incorporating benzotripyrrole, benzotriofuran, and benzotriselenophene central cores endowed with three-armed triphenylamine moieties (BTP-1, BTF-1, and BTSe-1, respectively) are designed, synthesized, and implemented in perovskite solar cells (PSCs). The impact that the heteroatom-containing central scaffold has on the electrochemical and photophysical properties, as well as on the photovoltaic performance, is systematically investigated and compared with their sulfur-rich analogue (BTT-3). The new HTMs exhibit suitable highest-occupied molecular orbitals (HOMO) levels regarding the valence band of the perovskite, which ensure efficient hole extraction at the perovskite/HTM interface. The molecular structures of BTF-1, BTT-3, and BTSe-1 are fully elucidated by single-crystal X-ray crystallography as toluene solvates. The optimized (FAPbI₃)_{0.85}(MAPbBr₃)_{0.15}-based perovskite solar cells employing the tailor-made, chalcogenide-based HTMs exhibit remarkable power conversion efficiencies up to 18.5%, which are comparable to the devices based on the benchmark spiro-OMeTAD. PSCs with BTP-1 exhibit a more limited power conversion efficiency of 15.5%, with noticeable hysteresis. This systematic study indicates that chalcogenide-based derivatives are promising HTM candidates to compete efficiently with spiro-OMeTAD.

2) A. Ferrer-Ruiz, T. Scharl, P. Haines, L. Rodríguez-Pérez, A. Cadranet, M. Á. Herranz, D. M. Guldi, N. Martín "Exploring Tetrathiafulvalene-Carbon Nanodots Conjugates in Charge Transfer Reactions" *Angew. Chem. Int. Ed.*, **2018**, 57, 1001–1005 - DOI:10.1002/ange.201709561.

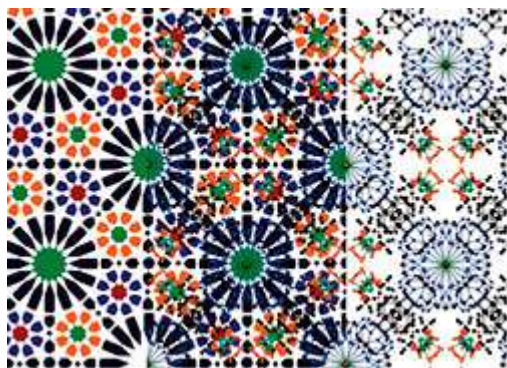


3) P. J. Evans, J. Ouyang, L. Favereau, J. Crassous, I. Fernández, J. Perles Hernández, N. Martín "Synthesis of a Helical Bilayer Nanographene" *Angew. Chem. Int. Ed.* **2018**, 57, 6774–6779 DOI: 10.1002/anie.201800798



A rigid, inherently chiral bilayer nanographene has been synthesized as both the racemate and enantioenriched M isomer (with 93 % ee) in three steps from established helicenes. This folded nanographene is composed of two hexaperi-hexabenzocoronene layers fused to a [10]helicene, with an interlayer distance of 3.6 Å as determined by X-ray crystallography. The rigidity of the helicene linker forces the layers to adopt a nearly aligned AA-stacked conformation, rarely observed in few-layer graphene. By combining the advantages of nanographenes and helicenes, we have constructed a bilayer system of 30 fused benzene rings that is also chiral, rigid, and remains soluble in common organic solvents. We present this as a molecular model system of bilayer graphene, with properties of interest in a variety of potential applications.

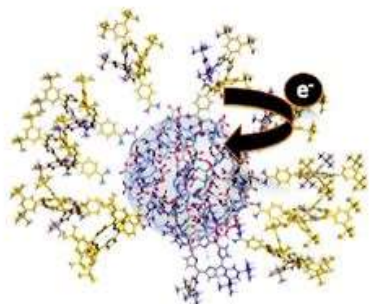
4) E. Fernandez-Bartolome, J. Santos, S. Khodabakhshi, L. J. Mc Cormick, S. J. Teat, C. Saenz de Pipaon, J. R. Galan-Mascarós, N. Martín, J. Sánchez Costa "A robust and unique iron(II) mosaic-like MOF" *Chem. Commun.*, **2018**, *54*, 5526--5529



“Científicos crean en Madrid un material parecido a un mosaico de la Alhambra” [La Vanguardia](#).

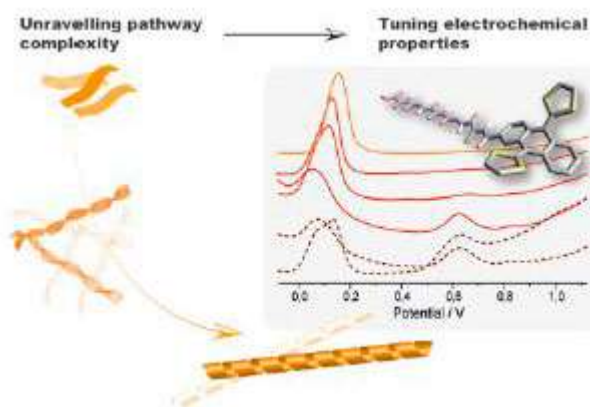
A novel extended triazole-based ligand (PM-Tria) has been synthesized and an unprecedented MOF 3D has serendipitously been formed by assembling iron(II), PM-Tria ligand and fluoride anions. This MOF contains a perfectly linear one-dimensional {Fe(II)-F}_n bridging chain that shows an antiferromagnetic behaviour. Furthermore, the structure is compared with a 14th century mosaic found in the Alhambra Palace in Granada showing a surprising symmetry resemblance.

5) T. Scharl, A. Cadranell, P. Haines, V. Strauss, S. Bernhardt, S. Vela, C. Atienza, F. Gröhn, N. Martín, D. M. Guldi, “Fine-tuning the assemblies of carbon nanodots and porphyrins”, *Chem. Commun.*, **2018**, *54*, 11642-11644 - DOI: [10.1039/c8cc05069d](https://doi.org/10.1039/c8cc05069d).



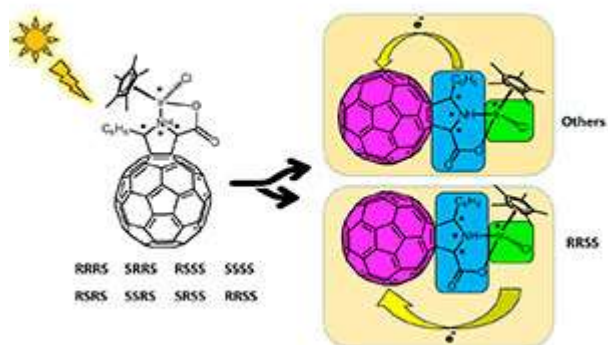
We present charge-transfer assemblies of electron accepting, pressure-synthesized carbon nanodots (pCNDs) and an electron donating porphyrin. Amidine derivatization of the porphyrin allows for hydrogen bonding interactions with the carboxyl groups on the surface of pCNDs, which drive the formation of the assembly. Upon photoexcitation, this electron donor–acceptor supramolecular construct features ultrafast charge separation, and subsequent charge recombination in 27 ps.

6) A. López-Andarias, J. López-Andarias, C. Atienza, F. J. Chichón, J. L. Carrascosa, N. Martín "Tuning optoelectronic and chiroptic properties of peptide-based materials by controlling the pathway complexity" *Chem. Eur. J.*, **2018**, *24*, 7755 – 7760 - DOI: [10.1002/chem.201801238](https://doi.org/10.1002/chem.201801238)



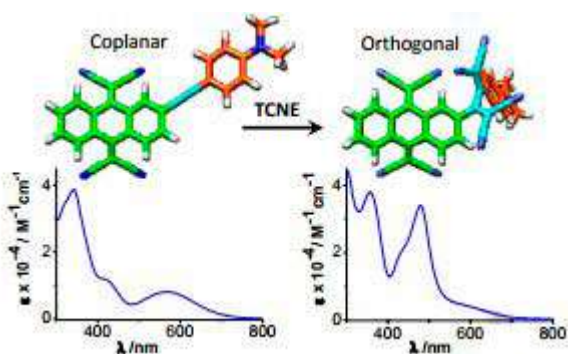
Supramolecular chemistry has evolved from the traditional focus on thermodynamic on-pathways to the complex study of kinetic off-pathways, which are strongly dependent on environmental conditions. Moreover, the control over pathway complexity allows nanostructures to be obtained that are inaccessible through spontaneous thermodynamic processes. Herein, we present a family of peptide-based π -extended tetrathiafulvalene (exTTF) molecules that show two self-assembly pathways leading to two distinct J-aggregates, namely metastable (M) and thermodynamic (T), with different spectroscopic, chiroptical, and electrochemical behavior. Moreover, cryo-transmission electron microscopy (cryo-TEM) reveals a different morphology for both aggregates and a direct observation of the morphological transformations from tapes to twisted ribbons.

7) J. Stasyuk, O. A. Stasyuk, S. Filippone, N. Martín, M. Solà, A. A. Voityuk " "Stereocontrolled photoinduced electron transfer in metal-fullerene hybrids" *Chem. Eur. J.* **2018**, *24*, 13020 – 13025 - DOI: [10.1002/chem.20180238](https://doi.org/10.1002/chem.20180238) (Hot paper)



Photoinduced electron transfer in transition-metal complexes linked to a fullerene moiety is of increasing interest. Recently, several stereoisomers of an Ir-complex exhibiting configurational stability at metal center, which does not undergo epimerization have been synthesized (*Angew. Chem. Int. Ed.* 2017, 56, 2136). The presence of multiple electron donor and acceptor sites located at opposite ends with respect to the metallic center creates the prerequisites for the formation of entirely different charge transfer (CT) states. Here we report the results of quantum mechanical calculations and detailed analysis of excited-state properties for all stereoisomers of the junction. We found that the stereoisomers demonstrate clearly different CT properties by photoexcitation. The found photo-stereospecific effects can be used to design new hybrids with a different type of photoinduced CT state, exhibiting dissimilar activity in photocatalysis.

8) R. García, J. Calbo, R. Viruela, M. A. Herranz, E. Ortí, N. Martín " The Role of planarity vs. Non-Planarity in the electronic Communication of TCAQ-Based Push-Pull Chromophores" *ChemPlusChem*, 2018, 83, 300 – 307 - DOI: 10.1002/cplu.201700553



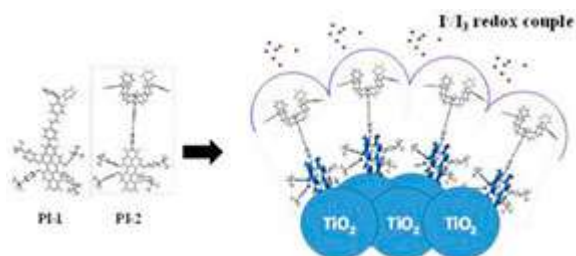
Donor–acceptor-substituted alkynes, endowed with 11,11,12,12-tetracyano-9,10-anthraquinodimethane (TCAQ) and N,N-dimethylaniline (DMA) units, have been further functionalized by a [2+2] cycloaddition with tetracyanoethylene (TCNE) followed by a subsequent retro-electrocyclization to form distorted nonplanar structures with bridging 1,1,4,4-tetracyanobuta-1,3-diene (TCBD) units. Comprehensive spectroscopic, electrochemical, and computational studies have been carried out to compare the electronic communication in planar (alkyne bridges) and nonplanar (TCBD bridges) TCAQ-based push–pull chromophores. Cyclic voltammetry and UV/Vis absorption measurements confirm the electronic communication between the TCAQ and DMA units despite the nonplanarity of the TCBD group. The experimental trends are strongly supported by density functional theory calculations, which further support the active electron-withdrawing role of the TCBD bridges. The novel push–pull TCAQ-based derivatives incorporating the TCBD bridge show a broad absorption in the whole visible range while the structures are highly distorted from planarity.

9) J. Urieta-Mora, I. García-Benito, A. Molina-Ontoria, N. Martín. "Hole Transporting Materials for Perovskites Solar Cells: A Chemical Approach" *Chem. Soc. Rev.*, 2018, 47, 8541-8571 - DOI: 10.1039/c8cs00262b



Photovoltaic solar cells based on perovskites have come to the forefront in science by achieving exceptional power conversion efficiencies (PCEs) in less than a decade of research. This “still young” generation of solar cells is currently rivalling, in PCEs, well-established technologies, such as cadmium telluride (CdTe) and silicon. Further improvements in device stability by means of innovative materials are yet to come, with technology becoming closer to meeting the market requirements. Emerging from this groundbreaking discovery, a great number of charge transporting materials have flourished, which is particularly true for hole transporting materials (HTMs). The huge number of molecules prepared stem from design and engineering of a wide variety of new and also chemically modified old molecules where organic synthesis has played a fundamental role. In this review, the contribution of chemistry through those synthetic protocols used for producing new and innovative HTMs from relatively simple organic molecules is presented in a rational and systematic manner. The variety and impact of synthetic strategies followed, the structure–property relationship and stability, conductivity and device performance are highlighted from a chemical viewpoint.

10) C. A. Echeverry, R. Cotta, A. Insuasty, A. Ortíz, N. Martín, L. Echegoyen, B. Insuasty "Synthesis of novel light harvesters based on perylene imides linked to triphenylamines for Dyes Sensitized Solar Cells" *Dyes and Pigments*, **2018**, *153*, 182–188 - DOI: doi.org/10.1016/j.dyepig.2018.02.009



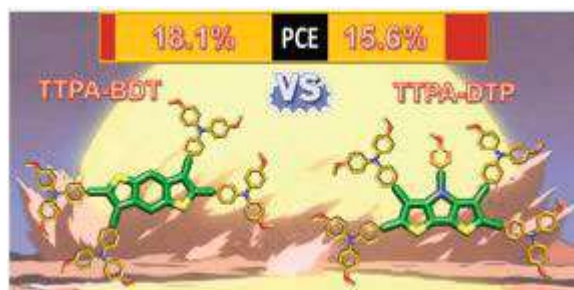
Dye Sensitized Solar Cells (DSSCs) are promising optoelectronic devices that use renewable energy and organic or organometallic dyes as light harvesters. They exhibit moderate overall efficiencies of power conversion that can be increased by improving the light-harvesting capacity of the organic dyes. Here, we report the synthesis, structural and electronic properties of two novel dyes based on perylene imides PI-1 and PI-2 as well as their application in DSSCs. In our design, design triphenylamine electron donors were linked to perylene-3,4,9,10-tetracarboxylic dianhydride derivative. The new dyes showed a broad absorption spectrum in the visible region as well as a strong push – pull electronic interaction determined computationally. Photovoltaic values for these dyes were not higher than previously reported compounds based on perylenes, with the best photovoltaic performance observed for the DSSCs based on PI-2, with an overall conversion efficiency of 1.3% under AM 1.5 irradiation (100 mW cm^{-2}). Although the electron transport to the TiO₂ surface for PI-1 and PI-2 was not efficient enough to result in a high photovoltaic behavior, our design has afforded dyes exhibiting a more efficient light capture in the visible region.

11) L. Almagro, D. Hernandez-Castillo, O. Ortiz, D. Alonso, A. Ruiz, J. Coro, M.A.Herranz, D. Molero, R. Martinez-Alvarez, M. Suarez, N. Martin "Steroid-Fullerene Hybrids from Epiandrosterone: Synthesis, Characterization and Theoretical Study" *Eur. J. Org. Chem*, **2018**, 4512–4522 DOI: [10.1002/ejoc.201800622](https://doi.org/10.1002/ejoc.201800622)



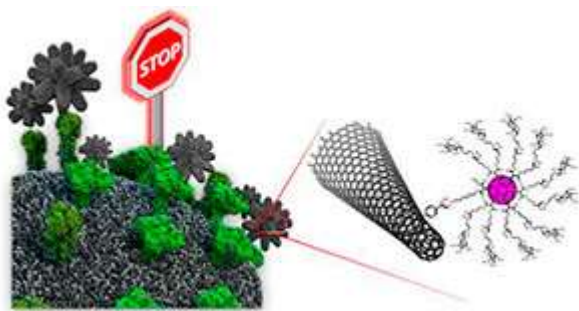
New hybrid fullerene–steroid derivatives were prepared by using the Bingel–Hirsch protocol, by treatment of [60]fullerene with malonates bearing the appropriate steroid moieties obtained, in turn, from the functionalization of epiandrosterone, an important naturally occurring steroid hormone. Monocycloadduct C60-steroid conjugates were obtained by functionalization of ring A or ring D of the steroid moiety. We have also described the multistep preparation of a [60]fullerene hybrid dumbbell endowed with two fullerene units connected through an epiandrosterone molecule by a cyclopropanation reaction. The new compounds have been spectroscopically characterized and their redox potentials, determined by cyclic voltammetry, reveal three reversible reduction waves for monocycloadducts (8, 9 and 11, 12), whereas dumbbell-type derivative 10 exhibits the best electron-accepting abilities of the Bingel-type fullerene–steroid series. Theoretical calculations at semiempirical (AM1) and single point B3LYP-D3/6-31G+(d,p) levels have predicted the most stable conformations for the hybrid compounds and allow explaining the observed regioselectivity in the cyclopropanation reaction with dimalonate 7 during the synthesis of the dumbbell derivative.

12) R. Sandoval-Torrientes, I. Zimmermann, J. Calbo, J. Aragón, J. Santos, E. Ortí, N. Martín, M. K. Nazeeruddin, “Influence of the Hole-Transporting Material’s Aromatic Core in Power Conversion Efficiency of Perovskite Solar Cells”, *J. Mater. Chem. A*, **2018**, *6*, 5944–5951 - DOI: [10.1039/C7TA11314E](https://doi.org/10.1039/C7TA11314E)



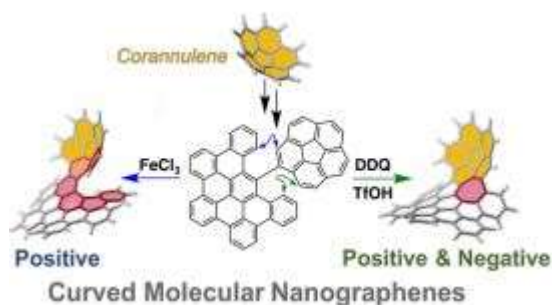
The development of highly efficient hole transporting materials (HTMs) for perovskite solar cells (PSCs) is still one of the most thrilling research subjects in the development of this emerging photovoltaic technology. Inner ring engineering of the aromatic core of new HTMs – consisting of three fused rings endowed with four triarylamine units – reveals major performance effects over the fabricated devices. In particular, substitution of the central pyrrole ring in dithienopyrrole (DTP) by a benzene ring – benzodithiophene (BDT) – allows enhancing the power conversion efficiency from 15.6% to 18.1%, in devices employing mixed-perovskite (FAPbI₃)_{0.85}(MAPbBr₃)_{0.15} (MA: CH₃NH₃⁺, FA: NH[double bond, length as m-dash]CHNH₃⁺) under 1 sun illumination. In comparison, 2,2',7,7'-tetrakis(N,N-di-p-methoxyphenylamine)-9,9'-spirobifluorene (spiro-OMeTAD) yielded a power conversion efficiency of 17.7%. The novel HTM molecules show an efficient quenching of the perovskite photoluminescence, indicating an efficient charge transfer from the active layer to the HTM, along with a good conductivity (comparable to that of the spiro-OMeTAD reference). Density functional theory (DFT) calculations allowed rationalizing the electrochemical and optical properties and predicting a reorganization energy (λ) for the best performing BDT-based HTM (0.101 eV) significantly lower than that computed for the benchmark spiro-OMeTAD (0.139 eV).

13) L. Rodríguez-Perez, J. Ramos-Soriano, A. Perez-Sánchez, B. M. Illescas, A. MunPoz, J. Luczkowiak, F. Lasala, J. Rojo, R. Delgado, N. Martín, “Nanocarbon-Based Glycoconjugates as Multivalent Inhibitors of Ebola Virus Infection”, *J. Am. Chem. Soc.*, **2018**, *140*, 9891–9898 - DOI: [10.1021/jacs.8b03847](https://doi.org/10.1021/jacs.8b03847)



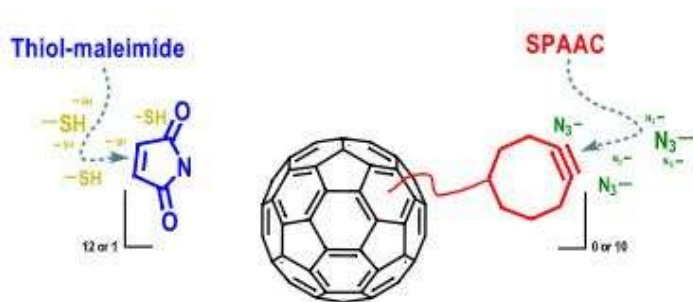
SWCNTs, MWCNTs, and SWCNHs have been employed as virus-mimicking nanocarbon platforms for the multivalent presentation of carbohydrates in an artificial Ebola virus infection model assay. These carbon nanoforms have been chemically modified by the covalent attachment of glycodendrons and glycofullerenes using the CuAAC “click chemistry” approach. This modification dramatically increases the water solubility of these structurally different nanocarbons. Their efficiency in blocking DC-SIGN-mediated viral infection by an artificial Ebola virus has been tested in a cellular experimental assay, finding that glycoconjugates based on MWCNTs functionalized with glycofullerenes are potent inhibitors of viral infection.

14) J. M. Fernández-García, P. J. Evans, S. Medina Rivero, I. Fernández, D. García-Fresnadillo, J. Perles, J. Casado, N. Martín* “ π -Extended Corannulene-based Nanographenes: Selective Formation of Negative Curvature”. *J. Am. Chem. Soc.* **2018**, *140*, 17188–17196. DOI: [10.1021/jacs.8b09992](https://doi.org/10.1021/jacs.8b09992)



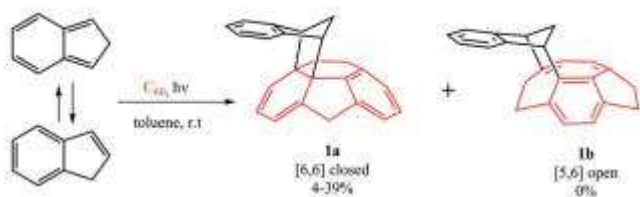
A geometrically selective bottom-up synthesis of curved nanographenes is described. The synthetic methodology used involves the extension of the π -system of positively curved corannulene by a [4+2] cycloaddition reaction followed by cyclodehydrogenation (Scholl oxidation). By selecting the conditions for the Scholl oxidation, the formation of a seven-membered ring that also confers negative curvature to the resulting nanographene can be activated, offering two topologically distinct, curved nanographenes from a common precursor. Additionally, the structure–property relationship in these new nanographenes is explored via theoretical, electrochemical, photophysical, Raman, and X-ray crystallographic studies.

15) J. Ramos-Soriano, J. J. Reina, B. M. Illescas, J. Rojo, N. Martín “Maleimide and Cyclooctyne-Based Hexakis-Adducts of Fullerene: Multivalent Scaffolds for Copper-Free Click Chemistry on Fullerenes” *J. Org. Chem.*, **2018**, *83*, 1727-1736 - DOI: [10.1021/acs.joc.7b02402](https://doi.org/10.1021/acs.joc.7b02402)



The synthesis of multivalent systems based on hexakis-adducts of [60]fullerene employing a biocompatible copper-free click chemistry strategy has been accomplished. A symmetric hexakis-adduct of fullerene bearing 12 maleimide units (3) is reported, and it has been employed to carry out the thiol-maleimide Michael addition. To achieve orthogonal click addition, an asymmetric derivative bearing one maleimide and 10 cyclooctynes has been synthesized. The sequential and one-pot transformations of the two clickable groups have been explored, finding the best results in the case of the one-pot experiment. This route has been used to obtain a biocompatible hexakis-adduct appended with two different biomolecules, carbohydrates, and amino acids.

16) O. El Bakouri, M. Garcia-Borrás, R. M. Girón, S. Filippone, N. Martín, M. Solá "On the regioselectivity of the Diels–Alder cycloaddition to C₆₀ in high spin states" *Phys. Chem. Chem. Phys.*, **2018**, *20*, 11577-11585 - DOI: [10.1039/c7cp07965f](https://doi.org/10.1039/c7cp07965f)



Controlling the regioselectivity in the exohedral functionalization of fullerenes and endohedral metallofullerenes is essential to produce specific desired fullerene derivatives. In this work, using density functional theory (DFT) calculations, we show that the regioselectivity of the Diels–Alder (DA) cycloaddition of cyclopentadiene to 2S+1C₆₀ changes from the usual [6,6] addition in the singlet ground state to the [5,6] attack in high spin states of C₆₀. Changes in the aromaticity of the five- and six-membered rings when going from singlet to high spin C₆₀ provide a rationale to understand this regioselectivity change. Experimentally, however, we find that the DA cycloaddition of isoindene to triplet C₆₀ yields the usual [6,6] adduct. Further DFT calculations and computational analysis give an explanation to this unanticipated experimental result by showing the presence of an intersystem crossing close to the formed triplet biradical intermediate.

17) R. M. Giroin, J. Ouyang, L. Favereau, N. Vanthuyne, J. Crassous, S. Filippone, N. Martín, "Reversible Stereodivergent Cycloaddition of Racemic Helicenes to [60]Fullerene: A Chiral Resolution Strategy" *Org. Lett.*, **2018**, *20*, 1764-1767 - DOI: [10.1021/acs.orglett.8b00256](https://doi.org/10.1021/acs.orglett.8b00256)



[60]Fullerene and its rarely explored reversible covalent chemistry have been harnessed as an efficient alternative for the chiral resolution of racemates. By using only catalytic amounts of chiral agents, stereodivergent 1,3-dipolar cycloadditions of racemic helicenes onto [60]fullerene were carried out. The formed helicene/fullerene diastereomers were easily separated by conventional chromatography, and afterward, a simple catalyzed 1,3-dipolar retro-cycloaddition afforded helicene starting materials in high optical purity.

THESIS

TÍTULO: "Covalent and supramolecular wires in the search for electrical and thermoelectrical properties"

DOCTORANDO: Valentina Sacchetti

UNIVERSIDAD: Complutense (Madrid)

FACULTAD/ESCUELA: Química

AÑO LECTURA: 11 de diciembre, 2018

CALIFICACIÓN: Sobresaliente "cum laude" por unanimidad



LECTURES

p-Figuration Japan-Spain Symposium, “Synthetic Chiral Carbon Nanoforms”, IMDEA_Nanociencia, Madrid (Spain), November 23 – 25, 2018 (*Invited lecture*)

Materiales Moleculares en Castellano, “Nanoformas de carbono moleculares quirales”, Salón de Grados de la Facultad de Ciencias de la Universidad de Málaga, Diciembre 14, 2018 (*Plenary lecture*)

2018 Barluenga Lectureship, “Synthetic Chiral Carbon Nanoforms”, Facultad de Medicina y Ciencias de la Salud, Universidad de Oviedo, November 8-9, 2018 (*Invited lecture*)

III Congreso Nacional de Jóvenes Químicos y Bioquímicos Terapéuticos (III QUIMBIOQUIM), “Bolas de azúcar de fullerenos contra el virus del Ébola”, Facultad de Farmacia de Albacete (UCLM), October 3-5 2018 (*Plenary lecture*)

CURO-p3. The Third International Symposium on the Synthesis and Applications of Curved Organic π -Molecules & Materials, “Synthetic Chiral Carbon Nanoforms”, University of Oxford, Department of Chemistry (UK), September 5-7, 2018 (*Invited lecture*)

AM30 Symposium Dresden. Advanced Carbon and 2D Materials (*Advanced Materials* 30th anniversary). WILEY, “Synthetic Chiral Carbon Nanoforms”, Wiley-VCH Dresden (Germany) July 16-17, 2018 (*Invited lecture*)

14th International Conference on Organic Electronics, “Efficient Hole Transporting Materials for Perovskite Solar Cells”, University of Bordeaux, Bordeaux (France), June 18-22, 2018 (*Plenary lecture*)

10th International Conference on Porphyrins & Phthalocyanines, (10-ICPP), “Repeat protein scaffolds: ordering photo- and electroactive molecules in solution and solid state” Munich (Germany), July 1-6, 2018 (*Invited lecture*)

233rd Electrochemical Society (ECS) Meeting, “Antiviral Activity of Self-Assembled Glycodendro[60]Fullerene Monoadducts”, ECS, Seattle, WA (USA), May 13-17, 2018 (*Invited lecture*)

233rd Electrochemical Society (ECS) Meeting, “Complexation and Electronic Communication of Corannulene-Based Buckybowls and a Curved Electron Donor”, ECS, Seattle, WA (USA), May 13-17, 2018 (*Invited lecture*)

233rd Electrochemical Society (ECS) Meeting, “Synthetic Chiral Carbon Nanoforms”, ECS, Seattle, WA (USA), May 13-17, 2018 (*Invited lecture*)

11th European School on Molecular Nanoscience (ESMolNa 2018), “Hole Transporting Materials for Highly Efficient Perovskite Solar Cells”, ICMol, Tenerife (Spain), May 20-25, 2018 (*Plenary lecture*)

255th ACS National Meeting. James Flack Norris Award Symposium in honor of Cindy Burrows, “Synthetic Chiral Carbon Nanoforms”, American Chemical Society (ACS), New Orleans (USA) March 18-22, 2018 (*Invited lecture*)

2nd International workshop on Frontiers in Chemistry of Molecular Materials, “Glycofullerenes: extremely efficient multivalent systems for Ebola virus infection”, IMDEA-Nanoscience, March 6-7, 2018 (*Invited lecture*)

Sino-Hispanic Meeting on Functional Conjugated Organic Materials for (Opto)Electronics & Thermoelectrics, “Highly-Efficient Perovskite Solar Cells from Sulfur-rich Hole-Transporting Materials”, IMDEA-Nanoscience (Madrid), February 2nd, 2018 (*Invited lecture*)

XVII Escuela Nacional de Materiales Moleculares, “Fullerenos y Grafenos: Curvatura vs Planaridad en Nanoformas de Carbono”, Universidad de Málaga, Torremolinos, Málaga (Spain) 11 a 16 de febrero de 2018 (*Plenary lecture*)

European Winter School in Physical Organic Chemistry (e-WISPOC 2018), “Multivalent Glycofullerenes for Ebola Virus Infection”, University Degli Studi of Padova, Bressanone (Italy), January 28 - February 2, 2018 (*Plenary lecture*)

European Winter School in Physical Organic Chemistry (e-WISPOC 2018), “A Current Story in Chemistry: The Carbon Nanoforms and Sir Harry W. Kroto”, University Degli Studi of Padova, Bressanone (Italy), January 28 - February 2, 2018 (*Plenary lecture*)

Christmas Lecture. “Synthetic Chiral Carbon Nanoforms”, School of Chemistry and Biochemistry. Université de Genève, Genève (Switzerland), December 20th, 2018 (*Invited conference*)

Conferencia invitada. “Synthetic Chiral Carbon Nanoforms”, École Polytechnique Fédérale de Lausanne, EPFL, Lausanne (Switzerland), October 11, 2018 (*Invited conference*)

Conferencia invitada. “Synthetic Chiral Carbon Nanoforms”, École Polytechnique Fédérale de Lausanne, EPFL, Sion (Switzerland), October 10, 2018 (*Invited conference*)

Semana de la Ciencia. “Nanociencia: la importancia de lo pequeño”, Museo de la ciencia de Orihuela (Alicante), 22 Noviembre 2018, (*Invited conference*)

Semana de la Ciencia CEU. “Nanociencia: la importancia de lo pequeño”, CEU, Montepíncipe, Madrid, 5 Noviembre 2018 (*Invited conference*)

I Edition of the research contest. BRAIN WARS The future in your hands. Madrid UCM Student Chapter – ECS. Facultad de Química. Universidad Complutense de Madrid, October 19, 2018 (*round table*)

Conferencia invitada. “Balones de azúcar de Fullerenos contra el virus del Ébola”, REAL ZARAGOZA Club de Tenis, October 18, 2018 (*Invited conference*)

XII Encuentro Nacional de Docentes de Química. “La tercera forma alotrópica del carbono y Sir Harry W. Kroto”, Universidad de Salamanca. Facultad de Química, Mayo 5, 2018 (*Invited conference*)

Physical Chemistry Colloquium. Invited lecture. “Multivalent Glycofullerenes for Ebola Virus Infection”, Ludwig-Maximilians Universität München (Germany). Faculty of Chemistry and Pharmacy, July 4, 2018 (*Invited conference*)

Ciclo Real Academia de Ciencias, RAC, en Casa de las Ciencias de Logroño, “Bolas de azúcar de Fullerenos contra el virus del Ébola”, Casa de las Ciencias de Logroño, Abril 26, 2018 (*Invited conference*)

Simposio "Bridging European Science II". “Presentación de COSCE y mesa redonda”, Embajada española en Berlín (Alemania), Junio 2, 2018 (*Invited conference*)

Conferencia Invitada. “Synthetic Chiral Carbon Nanoforms”, Universidad de la Laguna, Mayo 24, 2018 (*Invited conference*)

Conferencia Invitada. “Las nanofomas del carbono: la revolución científica del siglo XXI”, Curso de divulgación: Los Avances de la Química y su Impacto en la Sociedad (VI Edición), CSIC, Madrid, March 1st, 2018 (*Invited conference*)

Conferencia Invitada. “Bolas de azúcar de fullerenos contra el virus del Ébola”, Real Academia de Ciencias, Madrid, March 1st, 2018 (*Invited conference*)

Ciclo de conferencias “Ciencia para todos”. Conferencia Invitada. “Bolas de azúcar de fullerenos contra el virus del Ébola”, Real Academia de Ciencias (RAC), February 8, 2018, (*Invited conference*)