

CURRICULUM VITAE

PERSONAL INFORMATION

Family name, First name: **Palomares Gil, Emilio J.**

ResearchID: G-5251-2012; ORCID: 0000-0002-5092-9227

Website: http://www.iciq.org/research/research_group/prof-emilio-palomares/
<https://www.icrea.cat/Web/ScientificStaff/Emilio-Palomares-440>

RESEARCH OUTLOOK. I have always been very active and enthusiastic on the study of charge transfer reactions in materials applied to energy conversion and catalysis. His research has always been innovative and at the frontier of the topics he has focused on with critical results, i.e., A single atom change “switches-on” the solar-to-energy conversion efficiency of Zn-Porphyrin based dye-sensitized solar cells to 10.5%. From his early days at ICIQ as an **ERCstg Fellow and ICREA Research professor**—, he explored the use of time-resolved spectroscopy to characterize quantum dot solar cells, i.e. *Improving CdSe quantum dot/polymer solar cell efficiency through the covalent functionalization of quantum dots: implications in the device recombination kinetics*—to recently as **ICIQ Director and ERC Advanced Fellow** where he is focused on the study of molecular structure vs device function relationship from a spectroscopic view-point always focussed on solar-to-energy/products conversion systems and has also focussed on understanding CO₂ reduction using photo- and electro- catalytic methods.

As **ICREA Research Professor** at ICIQ, Prof. Palomares has consolidated an international research group focused on using organic molecules and materials for solar cells. This effort was recognized with an **ERC Starting Grant in 2009** to study the interfacial charge and energy transfer at the interface between quantum dots and semiconductor polymers. This expertise has also allowed him to work on the preparation of nanobiomolecular probes for the diagnosis of human diseases such as cystic fibrosis and chemosensors, a line of research awarded with an **ERC Proof of Concept Grant (2015)** and further valorized as spin-off technology. During these last years, he has also investigated perovskite-based solar cells, trying to understand the charge transfer kinetics and efficiency losses in the whole device and through the interfaces. Recently, he has extended his interest in CO₂ reduction catalysis using solar energy. Furthermore, his proposal of pioneering studies of quantum coherence effects on solar cells was awarded in 2023 with an **ERC Advanced Grant. This project aims to understand the quantum behaviour of energy and charge transfer in solar cells and use it to improve their efficiency.**

At ICIQ, he currently leads a research team composed of 2 senior researchers, 4 PostDocs, 6 PhD students, 1 master student, and 1 technician working on the above-mentioned topics, all funded through competitive programs from regional (AGAUR), national (MCIN) and European funding bodies (3 collaborative projects in FP6, 2 collaborative projects in FP7, 4 collaborative projects in H2020). In total, he has obtained over **4,7 million euros since 2012**. Emilio has also led **8 industrial projects** on materials for energy with different industries such as ACCIONA, TORRECID, and ATERSA, amongst others, and signed agreements with the technological centers of EURECAT and LEITAT. The possibility of transferring his knowledge to industrial partners was recognized with the **Innova award in 2010** by the SusChem platform (Sustainable Chemistry Industrial Platform). Finally, he co-authored **6 patents**, 5 of them international. In addition, he is currently the **Director of ICIQ** and the **Chair of the E2S at UPPA** (France).

LEADERSHIP IN INDUSTRIAL INNOVATION AND DESIGN

Prof. Palomares's research group has received substantial funding from industry and public funding agencies at the regional, national, and European levels. Back in 2006, ACCIONA (**Acciona Solar**), one of the largest Spanish companies investing in renewable energy, funded for 4 years the research of the group in dye-sensitized solar cells. Before, in 2004, **ATERSA**, a Spanish SME, supported its investigation into solar cells. Overall, Prof. Palomares's group has permanent industrial collaborations with energy and/or materials companies for 100.000€/year. Moreover, Emilio was the coordinator of the largest industrial project to study molecular solar cells in Spain, involving 6 public research centers, 2 technological centers, and 3 industries funded by the Spanish government with 871.200€ for 2 years. Since 2020, he has coordinated scientific and industrial actions between ICIQ and the **AEQT** (Industrial Chemical Association of Tarragona), Eurecat, and URV University. Several companies are commercializing molecules designed and developed by Palomares's group at ICIQ. In particular, the molecules EADR03 and EADR04, which Luminescence Technology Corp. (Lumtec) and Dyenamo commercialize.

CURRENT POSITION(S)

- 2020- **ICIQ Director**, Tarragona, Spain
2019- **E2S** (Energy and Environment Solutions) **Scientific Chair at UPPA** (Université de Pau et des Pays de l'Adour, France).
2008- ICREA Research Professor – **Institute of Chemical Research of Catalonia (ICIQ)**, Tarragona, Spain.

FELLOWSHIPS AND AWARDS

- 2023 **ERC Adv. Grant (Excited)**: *“Engineering Excited States, Orbital Coupling and Quantum Coherence Phenomena in Photoelectrochemical Energy Conversion Devices”*.
2023 Distintiu 9 d'Octubre from the City Hall of Cullera (Spain)
2021 Fellow of the **Spanish Royal Society of Chemistry (RSEQ)**
2015 **ERC Proof of Concept (2NanoSi)**: *“Ratiometric FRET Based Nanosensor for Trypsin Related Human Recessive Diseases”*.
2014 **Fellow of the Royal Society of Chemistry**.
2010 Innova **SUSCHEM-Spain Award** - Madrid, Spain.
2009 **ERC Starting Grant (Polydot)**: *“Control of the Electronic Properties in Hybrid-Quantum Dot/polymer Materials for Energy Production.”*
2008 **ICREA** (Catalan Institution for Research and Advanced Studies) Research Award.
2006 Spanish Royal Society of Chemistry (**RSEQ**) **Young Chemist Award**.
2004 **SIGMA-ALDRICH Distinguished Lecture** for Young Chemists, Madrid, Spain.
2004 **Roscoe Medal** “2004 Younger European Chemist’s Conference”-Torino, Italy.
2003 **Ramon y Cajal Fellowship**.
2002 **Marie Curie Fellowship** HPMF-CT-2002-01744 (**2002-2004**).
1992-1997 Spanish Ministry of Science and Education (MEC) fellowships.

SUPERVISION OF GRADUATE STUDENTS/POSTDOCTORAL FELLOWS AND TEACHING ACTIVITIES

At the Institute of Chemical Research of Catalonia (ICIQ), I have successfully directed **20 PhD theses** (5 more researchers are right now engaged on their PhD studies), 3 of them have been awarded with the Best PhD Thesis Award of the Year by the Rovira i Virgili University, Tarragona, Spain. I have also supervised **19 post-Doctoral researchers**. I am very proud that several of my former PhD students now hold positions in academia or industry in Europe and overseas: Dr. James W. Ryan – Lecturer at Swansea University (UK), Dr. Margherita Bolognesi – Researcher at the ISMN CNR, Bologna (Italy), Dr. Ivan Castello – Researcher at the University of Virginia (USA), Dr. Vijay Kumar Challuri – Researcher at the Université de Picardie (France), Dr. Taye Zewdu – Lecturer at AAIIT, AAU, Addis Ababa (Ethiopia), Dr. Josep Albero – Researcher at ITQ Universitat Politècnica de Valencia (Spain), Dr. Miquel Planells – Material Scientist (R&D) at Tracerco Ltd (Spain), Dr. Amparo Forneli – Universitat Politècnica de Valencia (Spain), Dr. Aurelien, Viterisi – Teaching and Research fellow at UPPA (France), Dr. Jose Manuel Beloqui – Researcher at the University of Malaga (Spain), Dr. Cristina Rodriguez Seco – Researcher at the Institute National de la Recherche Scientifique (Canada), Dra. Laia Pellejà- director iCERCA (Catalan Research Centres).

REVIEWING ACTIVITIES

The impact of my work is also reflected by the invitations to be **member of review panels**:

- ❖ ERC Consolidator Grant Panel (PE4) and ERC SAP 2020 Panel
- ❖ Reviewer for national projects in Spain (MCIN), Italy (CINECA), Taiwan (National Science Council), France (ANR), Italy (CRS), Israel (ISF), Poland, USA (DOE-BES) among other public funding bodies.

I also support several industries as a **consultant**: UK Carbon Trust (UK), AEQT (Spain), ATERSA (Spain), ACCIONA (Spain), Torrecid (Spain)

I am a **reviewer of noticeable scientific journals** such as Nature Materials, Nature Nanotechnology, Journal of the

American Chemical Society, Angewandte Chemie International Edition, Advance Energy Materials, and Journal of Materials Chemistry, amongst others.

Since 2011, I have been an **Advisory Board Member** of the RSC flagship journal Energy & Environmental Science (EES) (I.F. 38.5). From 2020, I am at the **Editorial Board** of Advanced Energy and Sustainability Research journal (Wiley).

I am often invited as **reviewer for PhD thesis** in Spain and overseas; for example: UK (Imperial College, thesis supervised by Prof. James R. Durrant, Dr. Saif A. Haque), Belgium (IMEC, thesis supervised by Prof. Jean Manca), Spain (UAM, Thesis supervised by Prof. Tomas Torres; ITQ-UPV-CSIC, Thesis Supervised by Prof. Hermenegildo García; UPO, Thesis supervised by Dr. Juan Antonio Anta; CSIC- Sevilla, Thesis supervised by Prof. Hernán Míguez).

MEMBERSHIPS OF SCIENTIFIC SOCIETIES

2021- Fellow of the Spanish Royal Society of Chemistry (RSEQ)
2014- Fellow of the Royal Society of Chemistry (RSC)

MAJOR COLLABORATIONS

Our group has established collaborations with international and national research groups such as Prof. James R. Durrant (Imperial College, UK), Prof. Nazeruddin (EPFL, Switzerland), Prof. Yun Chi (Taiwan National University, Taiwan), Prof. Juan Bisquert (UJI, Spain), Prof. Tomas Torres (UAM, Spain), Dr. Neil Robertson (Edinburgh University, UK), Prof. G. D. Sharma (JNV University, India), Prof. Jenny Nelson (Imperial College, UK), Prof. Filippo de Angelis (CNRS, Italy), Prof. Fernando Langa (UCLM, Spain), Prof. Nazario Martin (UCM, Spain), Prof. Arie Zaban (Bar-Ilan University, Israel), Dr. Renaud Demadrille (CNRS, France) among other top scientists.

RESEARCH METRICS

I have published over **286 Peer-reviewed publications and 2 book chapters** with a **total number of citations of 17787** and **6 patents**. My **h-index is 68**, according to Scopus. I have taken part in **9 EU funded research projects, 16 national research projects and 8 research projects with industries**. I have given over 100 invited lectures at international and national conferences, and I receive over 5 invitations per year to be a key speaker at different international conferences.

FIVE SELECTED PUBLICATIONS AS CORRESPONDING AUTHOR

1. **Electro-and Photoinduced Interfacial Charge Transfers in Nanocrystalline Mesoporous TiO₂ and TiO₂/Iron Porphyrin Sensitized Films under CO₂ Reduction Catalysis.** B Domingo-Tafalla, T Chatterjee, F Franco, J Perez-Hernandez, E Martinez-Ferrero, P Ballester, E Palomares *ACS Applied Materials & Interfaces*, 2023, 15 (11), 14304-14315.
2. **Influence of the carbazole moiety in self-assembling molecules as selective contacts in perovskite solar cells: interfacial charge transfer kinetics and solar-to-energy efficiency effects** DA González, CE Puerto Galvis, W Li, M Méndez, E Aktas, E Martínez-Ferrero, E Palomares *Nanoscale Advances* 2023, 5 (23), 6542-654
3. **Self-assembled molecules for hole-selective electrodes in highly stable and efficient inverted perovskite solar cells with ultra-low energy loss.** W. Li, M. Cariello, M. Méndez, G. Cooke, E. Palomares *ACS Applied Energy Materials* 2023 6 (3), 1239-1247.
4. **Role of Terminal Group Position in Triphenylamine-Based Self-Assembled Hole-Selective Molecules in Perovskite Solar Cells** E. Aktas, R. Pudi, N. Phung, R. Wenisch, L. G., D. Meggiolaro, M. A. Flatken, F. D. Angelis, I. Laueremann, A. Abate, E. Palomares *ACS Applied Materials & Interfaces* 2022, 14 (15), 17461-17469. Citations: 13.
5. **Understanding the perovskite/self-assembled selective contact interface for ultra-stable and highly efficient p-i-n perovskite solar cells.** E. Aktas, N. Phung, H. Köbler, DA González, M. Méndez, I. Kafedjiska, SH Turren-Cruz, R. Wenisch, I Laueremann, A. Abate, E. Palomares *Energ. Env. Sci.* 2021, 14 (7), 3976-3985. Citations: 29.

SELECTION OF 5 INVITED REVIEW ARTICLES & BOK CHAPTERS in the last 8 years:

1. **Challenges in the design and synthesis of self-assembling molecules as selective contacts in perovskite solar cells.** C. Puerto Galvis, DA. González Ruiz, E. Martínez-Ferrero, E. Palomares *Chemical Science* 2024, 15, 1534-1556. Selected ad Pick of the Week and inner cover.
2. **Self-assembled molecules as selective contacts for efficient and stable perovskite solar cells.** W. Li, E. Martínez-Ferrero, E. Palomares, *Materials Chemistry Frontiers* 2024, 8, 681-699.
3. **Challenges and strategies toward long-term stability of lead-free tin-based perovskite solar cells.** E. Aktas, N. Rajamanickam, J. Pascual, S. Hu, M. H. Aldamasy, D. D. Girolamo, W. Li, G. Nasti, E. Martínez-Ferrero, A. Wakamiya, E. Palomares, A. Abate *Communication Materials*, 2022, 3, 104. Citations: 31.
4. **Advances in the synthesis of small molecules as hole transport materials for lead halide perovskite solar cells.** C. Rodrigez-Seco, L. Cabau, A. Vidal-Ferran, E. Palomares *Acc. Chem. Res.* 2018, 51 (4), 869-880. Citations: 128.
5. **Graphene and carbon quantum dot-based materials in photovoltaic devices: From synthesis to applications.** S. Paulo, E. Palomares, E. Martinez-Ferrero *Nanomaterials* 2016, 6 (9), 157. Citations: 149.

INTERNATIONAL PATENTS

1. WO/2014/206918: 'Ratiometric assay for hydrolytic enzyme quantification' Palomares, E., Stoica, G., Castello Serrano, I. (2014)
2. WO/2008/145172: 'Tri-tert-butylcarboxyphthalocyanines, uses thereof and a process for their preparation' Torres Cebada, T., Cid Martin, J. J., Nazeerudin, M. K., Yum, J. H., Graetzel, M., Palomares, E. (2008)
3. WO/2008/025977: 'Mercury scavenging' Durrant, J., Palomares, E., Li Xiaoe. (2008)
4. US 20060144720: 'Chemical Sensors' Durrant, J., Palomares, E., Vilar, R. (2006)
5. WO/2004/013062: 'Low-temperature metal oxide coating' Palomares, E., Clifford, J., Haque, S.A., Lutz, T. Durrant, J. R. (2004)

INVITED LECTURES

I have given 100 invited and plenary lectures over the last 10 years, including the following selected keynote lectures:

1. nanoGe MATSUS - STECH Conference 2023. Barcelona, Spain.
2. Fundación Areces 2023. Madrid (Spain)
3. Gordon Research Conference on Hybrid Electronic and Photonic Materials and Phenomena, 2022. Spain.
4. Hybrid & Organic Photovoltaics International Conference HOPV22, 2022 Valencia, Spain.
5. Organic Materials in Perovskite-based Optoelectronic Devices 2021, online Spain
6. NGMF19 NanoGe Fall Meeting Berlin, 2019. Berlin. Germany
7. International Bunsen-Discussion-Meeting. 2019. Taormina, Italy
8. 3rd International Conference on Perovskite Solar Cells and Optoelectronics (PSCO17), 2017. Oxford (UK)
9. The 6th Sungkyun International Solar Forum 2017 2017 Seoul, South Korea
10. European Optical Society Annual Meeting (EOSAM) 2016, Berlin, Germany
11. E-MRS 2016 FALL, 2016 Warsaw, Poland
12. 225th ECS Meeting 2014. Orlando. USA
13. 2nd International Congress "Next Generation Solar Energy" 2013, Erlangen. Germany.
14. E2KW-Energy and Environmental Knowledge Week 2013. Toledo. Spain.
15. SPIE Photonic West 2013. San Francisco, USA
16. 7th Aseanian Conference on DSC & OPV 2012. Taipei, Taiwan.
17. SPIE-Photonics Europe 2012. Brussels. Belgium.