CURRICULUM VITAE

PERSONAL INFORMATION

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

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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. My research has always been innovative and at the frontier of the topics where I have focused on with critical results. From my early days at ICIQ as an **ERCstg Fellow and ICREA Research professor**, I have explored the use of time-resolved spectroscopy to characterize quantum dot solar cells. Recently as **ICIQ Director and ERC Advanced Fellow**, I am currently focused on the study of molecular structure vs device function relationship from a spectroscopic viewpoint. The final aim has always been solar-to-energy/products conversion systems and understanding CO_2 reduction using photo- and electro- catalytic methods.

As **ICREA Research Professor** at ICIQ, I have consolidated an international research group working on 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 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, I have 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, I have extended my interest in CO_2 reduction catalysis using solar energy. Furthermore, my proposal of pioneering studies about quantum coherence effects on solar cells was awarded in 2023 with an **ERC Advanced Grant. This project aims to understand the quantum behavior of energy and charge transfer in solar cells and apply it to improve their efficiency.**

At ICIQ, I currently lead a research team composed of 2 senior researchers, 4 PostDocs, 6 PhD students, 2 master students, 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, I have obtained over **10.2 million euros during my career as an independent researcher**. I have 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 knowledge to industrial partners was recognized with the **Innova award in 2010** by the SusChem platform (Sustainable Chemistry Industrial Platform). Finally, I have co-authored **6 patents**, 5 of them international. In addition, I have been the **Chair of the E2S at UPPA** (France) between 2019 and 2024.

LEADERSHIP IN INDUSTRIAL INNOVATION AND DESIGN

The 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, I was the coordinator of the largest industrial project to study molecular solar cells in Spain, involving 6 public research centres, 2 technological centres, and 3 industries funded by the Spanish government with 871.200 € for 2 years. Since 2020, I have coordinated scientific and industrial actions between ICIQ and the **AEQT** (Industrial Chemical Association of Tarragona), Eurecat, and Universitat Rovira I Virgili (URV). Several companies are commercializing molecules designed and developed by Palomares's group at ICIQ. In particular, the molecules EADR03 and EADR04 are produced by Luminescence Technology Corp. (Lumtec) and Dyenamo for application in perovskite solar cells and organic cells. The market estimate for the use of SAMs in perovskite cells is $180 million by 2030.

Since 2023 I have been coordinating as ICIQ Director the scientific and industrial actions, focused on the decarbonisation of the electro-intensive industry and the sustainability of its processes, between the ICIQ and the AEQT, Eurecat and URV for a value of more than 20 million € and the design and construction of 4 pilot plants for the capture and use of CO_2.

CURRENT POSITION(S)

2020- **ICIQ Director,** Tarragona, Spain

2019-2024 **E2S** (Energy and Environment Solutions) **Scientific Chair at UPPA** at 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

2024 Narcís Monturiol Medal for Scientific and Technological Merit by the Generalitat de Catalunya.

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 **22 PhD theses** (6 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 URV. I have also supervised **20 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 Università degli Studi di Parma (Italy), Dr. Vijay Kumar Challuri – Researcher at the Université de Picardie (France), Dr. Taye Zewdu – Lecturer at AAiT, 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 CERCA (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 a **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 **298 Peer-reviewed publications and 2 book chapters** with a **total more than 22.200 citations** 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 received over 5 invitations per year to be a key speaker at different international conferences.

FIVE SELECTED PUBLICATIONS AS CORRESPONDING AUTHOR

1. Ece Aktas, Nga Phung, Hans Köbler, Dora A. González, Maria Méndez, Ivona Kafedjiska, Silver-Hamill Turren-Cruz, Robert Wenisch, Iver Lauermann, Antonio Abate, **Emilio Palomares**. "Understanding the perovskite/self-assembled selective contact interface for ultra-stable and highly efficient p–i–n perovskite solar cells", *Energ. Env. Sci.* **2021**, 14, 3976-3985. *(Journal IF 39.714)*
2. Cristina Rodríguez-Seco, Maria Méndez, Cristina Roldán-Carmona, Ravi Pudi, Mohammad Khaja Nazeeruddin, **Emilio Palomares**. "Minimization of carrier losses for efficient perovskite solar cells through structural modification of triphenylamine derivatives", *Angew. Chem.* **2020**, *132* (13), 5341-5345. *(Journal IF 2020 15.336)*
3. Ilario Gelmetti, Núria F. Montcada, Ana Pérez-Rodríguez, Esther Barrena, Carmen Ocal, Ines García-Benito, Agustín Molina-Ontoria, Nazario Martín, Anton Vidal-Ferran, **Emilio Palomares**. "Energy alignment and recombination in perovskite solar cells; weighted influence on the open circuit voltage**."** *Energy Environ*. Sci., **2019**, *12* (4) 1309-1316. *(JIF 33.250)*

4. E. Yalcin, M. Can, C. Rodríguez-Seco, E. Acktas, R. Pudi, W. Cambarau, S. Demiç, **Emilio Palomares** "Semiconductor self-assembled monolayers as selective contact for efficient PiN perovskite solar cells." *Energy Environ*. Sci., **2019**, *12* (1) 230-237. *(JIF 33.250)*.
5. Cristina Rodríguez-Seco, Lydia Cabau, Anton Vidal-Ferran, **Emilio Palomares**. "Advances on the Synthesis of Small Molecules as Hole Transport Materials for Lead Halide Perovskite Solar Cells." *Accounts of Chemical Research* **2018**, *51*, 869-880. *(JIF 21.661)*

SELECTION OF 5 INVITED REVIEW ARTICLES & BOK CHAPTERS in the last 10 years:

1. C. Puerto Galvis, DA. González Ruiz, E. Martínez-Ferrero, **E. Palomares**, "Challenges in the design and synthesis of self-assembling molecules as selective contacts in perovskite solar cells", *Chemical Science* 2024, 15, 1534-1556. Selected ad Pick of the Week and inner cover. Citations: 34.
2. W. Li, E. Martínez-Ferrero, **E. Palomares**, "Self-assembled molecules as selective contacts for efficient and stable perovskite solar cells", *Materials Chemistry Frontiers* 2024, 8, 681-699. Citations: 24.
3. 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, "Challenges and strategies toward long-term stability of lead-free tin-based perovskite solar cells". *Communication Materials*, 2022, 3, 104. Citations: 80.
4. C. Rodrigez-Seco, L. Cabau, A. Vidal-Ferran, **E. Palomares**, "Advances in the synthesis of small molecules as hole transport materials for lead halide perovskite solar cells", *Acc. Chem. Res.* 2018, 51 (4), 869-880. Citations: 144.
5. S. Paulo, **E. Palomares**, E. Martinez-Ferrero, "Graphene and carbon quantum dot-based materials in photovoltaic devices: From synthesis to applications" *Nanomaterials* 2016, 6 (9), 157. Citations: 166.

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. Joint Chemical Science Royal Society of Chemistry-the Chemical Society of Japan Symposium 2024: Materials for energy storage and conversion, **2024**, London, UK.
2. #NanoSeries2024: 3rd Annual Nanotechnology Conference, **2024**, Lisboa, Portugal.
3. 6th International Conference on Hybrid and Organic Photovoltaics (HOPV) **2024**, Valencia, Spain.
4. nanoGe MATSUS – Spring Conference **2024**. Barcelona, Spain.
5. nanoGe MATSUS - STECH Conference **2023**. Barcelona, Spain.
6. Fundación Areces **2023**. Madrid (Spain)
7. Gordon Research Conference on Hybrid Electronic and Photonic Materials and Phenomena, **2022**. Spain.
8. Hybrid & Organic Photovoltaics International Conference HOPV22, 2022 Valencia, Spain.
9. Organic Materials in Perovskite-based Optoelectronic Devices **2021**, online Spain
10. NGMF19 NanoGe Fall Meeting Berlin, **2019**. Berlin. Germany
11. International Bunsen-Discussion-Meeting. **2019**. Taormina, Italy
12. 3rd International Conference on Perovskite Solar Cells and Optoelectronics (PSCO17), **2017**. Oxford (UK)
13. The 6th Sungkyun International Solar Forum 2017 **2017** Seoul, South Korea
14. European Optical Society Annual Meeting (EOSAM) **2016,** Berlin, Germany
15. E-MRS 2016 FALL, **2016** Warsaw, Poland