



## Part A. PERSONAL INFORMATION

CV date 21/03/2024

|                                                |                      |                         |            |
|------------------------------------------------|----------------------|-------------------------|------------|
| First name                                     | Teresa               |                         |            |
| Family name                                    | Puig Molina          |                         |            |
| Gender (*)                                     | female               | Birth date (dd/mm/yyyy) | 20/07/1966 |
| Social Security, Passport, ID number           |                      |                         | 39174185X  |
| e-mail                                         | teresa.puig@icmab.es | URL Web                 |            |
| Open Researcher and Contributor ID (ORCID) (*) |                      | 0000-0002-1873-0488     |            |

(\*) Mandatory

### A.1. Current position

|                   |                                                                                                                                    |                                                 |               |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|---------------|
| Position          | Research Professor                                                                                                                 |                                                 |               |
| Initial date      | 01/03/2010                                                                                                                         |                                                 |               |
| Institution       | Agencia Estatal Consejo Superior de Investigaciones Científicas                                                                    |                                                 |               |
| Department/Center | Superconducting materials and large scale nanostructures                                                                           | Instituto de Ciencia de Materiales de Barcelona |               |
| Country           | Spain                                                                                                                              | Teleph. number                                  | +34 935801853 |
| Key words         | Superconductivity, functional oxides, chemical solution deposition, epitaxial growth, vortex physics, superconducting applications |                                                 |               |

### A.2. Previous positions (research activity interruptions, art. 14.2.b))

| Period    | Position/Institution/Country/Interruption cause             |
|-----------|-------------------------------------------------------------|
| 2007-2010 | Research Scientist, ICMAB-CSIC, Spain                       |
| 2000-2007 | Tenured Scientist, ICMAB-CSIC, Spain                        |
| 1997-2000 | MEC postdoc researcher, ICMAB-CSIC, Spain                   |
| 1995-1997 | Postdoc researcher, Katholieke Universiteit Leuven, Belgium |

### A.3. Education

| PhD, Licensed, Graduate | University/Country                | Year |
|-------------------------|-----------------------------------|------|
| PhD in Physics          | Universitat Autònoma de Barcelona | 1994 |
| Physics Degree          | Universitat Autònoma de Barcelona | 1989 |

## Part B. CV SUMMARY (max. 5000 characters, including spaces)

I have been in research for more than 30 years and since 2010 I'm Research Professor at ICMAB-CSIC. During this time, I spent 46 months at international research institutions (KTH Stockholm, Trinity College Dublin, Regensburg Univ, KU Leuven). Since 2008 I'm head of the Superconducting Materials and Large Scale Nanostructure Department at ICMAB-CSIC, since 2016 I'm Research Line leader in the two Excellence Severo Ochoa awards at ICMAB-CSIC.

I have stimulated interdisciplinary science, with critical mass, contributing extensively in the physical understanding of high temperature superconductors (HTS), growth and characterization of Coated Conductors (CC), vortex physics mechanisms, oxide nanoobjects (nanoparticles, nanowires, nanoislands), Resistive Switching in strongly correlated oxides, superconducting materials integration in device (fault current limiters, wind generators, cables, motors, and recently high energy physics applications). Nowadays, my group (~25 members) is an international reference in the area of superconducting materials and applications.

One of my main scientific contributions is that related to low cost chemical solution deposition (CSD) of CC, which attracted my attention in early 2000. I built, together with Prof. X. Obradors, a large interdisciplinary group (chemists, physicist, material scientist). We leaded the international scene of CSD HTS films and vortex physics with key contributions (i.e. 2 Nature Materials (721 citations), 6

contributions to SUST-IOP- each one with 97 to 224 citations, and many others publications). In 2015 I was awarded an ERC-AdG for a breakthrough idea associated to a new TLAG-CSD method that demonstrated growth rates beyond 100 nm/s (Nature Communications, 2 plenary and 11 invited talks). Recently, TLAG has also attracted the attention of industry. I have signed a contract with Sumitomo Electric Industry Ltd. (one of the main players in superconducting industry) to initiate a technology transfer activity. It was also awarded an ERC-PoC to identify potential market and an IPR strategy. At present, we have an industrial secret, a patentability study is being elaborated and a second ERC-PoC was submitted related to TLAG colloidal inks scalability. Moreover, I received NGEU CSIC funds to set up an installation in ALBA for in-situ XRD analysis of TLAG kinetic mechanisms (PTI+ Energy). Another relevant scientific contribution is that related to the integration of HTS coated conductors to High Energy Physics (HEP) devices for energy saving. In 2016, I convinced CERN of the use of CC in beam-screen chamber of FCC collider. I created a consortium with the ALBA accelerator division, High Energy Physics institute (IFAE) and Microwave group at UPC. At ICMAB, I built a team of physicist and engineers that nowadays, together with Dr. Joffre Gutierrez, we are leading this research. Our innovative surface coating methodology was incorporated in the CERN Future Circular Collider Conceptual Design Report. In 2020, the CERN contract was renewed and we expanded our activity to Axion haloscope cavities for Dark Matter search. NGEU funds from "planes complementarios" of Astrophysics and High Energy Physics have been assigned to this activity.

During my scientific career, I'm / have been at the Editorial Board of SUST (IOP) for 14 years, European Society for Applied Superconductivity (ESAS) (since 2007) and Superconducting News Forum (since 2013). I was co-founder of the spin-off company OXOLUTIA (2010-2020). I have been PI of 11 national (including 5 materials PN and 3 RTC-industrial), 6 EU projects (including an ERC-AdG and ERC-PoC), 2 CERN project, 2 Sumitomo Electric contracts). I was group leader of a CONSOLIDER and Research Line leader of two ICMAB Severo Ochoa excellence awards, managing committee delegate in two COST actions. I have given 3 plenaries and over 35 invited talks at international conferences, co-organized 9 international conferences (3 MRS-spring symposiums). I am evaluator of EU (including an ERC panel member), national and international projects and research positions, evaluator of the Applied Physics Depart. of Twente Univ., and member of the evaluation committee of the Impulz programme from the Slovak Academy of Sciences. I have received Duran Farrell award (2002), Novare-Endesa (2007), ITEK Award (2012) and the "Barcelona City prize to Experimental science and technology 2015". I'm also at the advisor committee of the 2030 agenda of Barcelona city. I published 375 articles, 8040 citations, h-index=43, in Nat Rev Phys, Nat Phys, Nat Mat, Nat. Comm., Sci Rep, PRL, Chem Mat, Adv. Mat, JACS, Adv. Funct. Mat., Chem Comm, Small, Chem. Mat., APL, Nanoscale, PRB, SUST,..., filed 12 patents and 1 industrial secret. I have supervised 26 PhD thesis, 1/3 are nowadays research group leaders in national or international centers 1/3 are pursuing postdocs and 1/3 incorporated in industry. In the last 10 years I have participated in 44 science outreach activities (publications, videos, exhibitions, press release, roundtables, lectures, TV and radio programs, news on social media, supervisor of young teenagers in science programs).

## **Part C. RELEVANT MERITS** (sorted by typology)

### **C.1. Publications** (see instructions: \* corresponding author)

- T. Puig\*, J. Gutierrez, X. Obradors, (2024) "*Impact of high growth rates on the microstructure and vortex pinning of high temperature superconducting coated conductors*", **Nature Reviews Physics**, 6, 132-148
- A. Stangl\*, A. Palau, G. Deutscher, X. Obradors and T. Puig\* (2021) *Ultra-high critical current densities of superconducting YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-δ</sub> thin films in the overdoped state*, **Sci. Reports** 11: 8176 (1-12)
- A. Queraltó\*, J. Banchewski, A. Pacheco...T. Puig\* (12/12) (2021) *Combinatorial Screening of Cuprate Superconductors by Drop-On-Demand Inkjet Printing*, **ACS Appl. Mat. & Interfaces** 13:9101-9112
- L. Soler, J. Jareño, J. Banchewski,... T. Puig\* (13/13) (2020) *Ultrafast transient liquid assisted growth of high current density superconducting films*, **Nature Communications** 11: 344(1-8)
- J. C. Gonzalez-Rosillo, S. Catalano, I. Maggio-Aprile, M. Gibert, X. Obradors, A. Palau, T. Puig\* (2020) *Nanoscale Correlations between Metal-Insulator Transition and Resistive Switching Effect in Metallic Perovskite Oxides*, **Small** 16: 2001307(1-10)
- A. Romanov\*, P. Krković, G. Telles...T. Puig\*, J. Gutierrez (9/10) (2020) *High frequency response of thick REBCO conductors in the framework of the FCC study*, **Sci. Reports** 10:12325(1-12)

- B. Mundet, S. Hartmam, R. Guzmán, J. C. Idrobo, X. Obradors, T. Puig, R. Mishra and J. Gazquez\* (2019) *Local strain-driven migration of oxygen vacancies to apical sites in  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$* , **Nanoscale** 12: 5922-5931
- V. Rouco, C. Navau, N. del Valle, ..., T. Puig(8/11), ..., A. Palau\* (2017) *Depairing current at high magnetic fields in vortex-free high-temperature superconducting nanowires*, **Nano letters** 19: 4174
- A. Gomez\*, M. Gich, A. Carretero, T. Puig and X. Obradors (2017) *Piezo-generated charge mapping revealed through direct piezoelectric force microscopy* **Nature Communications** 8: 1113(1-10)
- J. Gazquez\*, R. Guzman, R. Mishra... T. Puig(16/17) and X. Obradors (2016) *Emerging Diluted Ferromagnetism in High-Tc Superconductors Driven by Point Defect Clusters*, **Advanced Science** 3: 1500295(1-8)
- X. Obradors\* and T. Puig (2014) *Coated conductors for power applications: materials challenges* **Supercond. Sci. Technol.** 27: 044003 (1-17) - **295 citations**
- X. Obradors\*, T. Puig, S. Ricart, M. Coll, J. Gazquez, A. Palau, X. Granados (2012) *Growth, nanostructure and vortex pinning in superconducting  $\text{YBa}_2\text{Cu}_3\text{O}_7$  thin films based on trifluoroacetate solutions*, **Supercond. Sci. Technol.** 25: 123001 (1-32) - **158 citations**
- A. Llordes\*, A. Palau, J. Gazquez,...T. Puig(13/21),...X. Obradors (2012) *Nanoscale strain-induced pair suppression as a vortex-pinning mechanism in high-temperature superconductors* **Nature Materials** 11: 329-336– **292 citations**
- J. Gutierrez, ...T. Puig (),...X. Obradors (2007) *Strong isotropic flux pinning in solution derived YBCO nanocomposite superconducting films*, **Nature Materials** 6, 367-373- **530 citations**

## C.2. Congress

- “Transient Liquid Assisted Growth (TLAG), a method for increasing coated conductors throughput and meeting future”, T. Puig, International Superconductivity Symposium **ISS-2023**, Wellington (New Zeland), Dec 2023 –**Invited**
- “Overview on progress, challenges and frontier research of coated conductors for application, **EUCAS 2023**, Bologna (Italy), Sept-2023- **Plenary**
- “Materials opportunities to boost HTS-CC. Example of Transient liquid Assisted Growth”, T. Puig, International. Workshop on Coated Conductors for Applications, **CCA 2021**, Japan (online), Oct 2021. - **Invited**
- “Can we reach fast growth for Coated Conductors at competitive costs?,” T. Puig, European Conference on Applied Superconductivity, **EUCAS 2019**, Glasgow, Sep 2021-**Invited**
- “Vortex pinning landscape in low cost chemical solution Nanocomposite YBCO coated conductor”, T Puig, Cryogenic Engineering Conference and International Cryogenic Materials Conference **CEC-ICMC 2017**, USA, Madison, USA, July 2017 - **Invited**
- “Nanocomposite Coated Conductors: towards optimal vortex pinning for high field applications”, T.Puig, European Conference on Applied Superconductivity **EUCAS 2015**, Lyon (France), 6-10 Sept 2015 –**Plenary**
- “Opportunities of solution grown YBCO coated conductors. Let’s push them further” T. Puig. Inter. Workshop on Coated Conductors for Application **CCA2014**, Jeju (Korea), Dec 2014 - **Plenary**
- “Volume resistive switching in complex oxides with metal-insulating transition for ReRAM memories”, T. Puig 24<sup>th</sup> Non-Volatile Memory Technology symposium, **NVMTS 2014**, Jeju, Korea, Oct 2014. - **Invited**
- “Growth of functional oxide epitaxial nanostructured films and nanostructures by chemical solution deposition”, T. Puig, Material Research Society Spring Meeting **MRS 2012**, San Francisco, USA, April 2012. - **Invited**

## C.3. Recent research projects

- **Superconducting Materials (TRE2102002)** TRANS-ENER+ High Technology for energy transion (RECEUTRE2021), PTI+ Energy-ALBA test platform, CSIC NGEU, PI: Teresa Puig, 01/04/2021-31/12/2022, 309.595€
- Superconducting materials in Dark Matter Search, **Supplementary plans program for Astrophysics and High Energy Physics**, #PlanEspanyaPuede, MICCIN-CCA NGEU, Cord: Ramon Miquel (IFAE), PI-ICMAB: Teresa Puig, 01/01/2022-31/12/2025, 500k€ (Total: 15 M€)

- Industrial manufacturing process for a high temperature superconducting coated conductors technol., **IMPACT, EU ERC Proof-of-Concept**, PI: Teresa Puig, 01/01/2020-31/12/2021, 150k€.
- Superconducting REBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> Materials and functionalities for Technological devices, **SuMaTe, RTI2018-095853-B-C21**, MICIU, PI: Teresa Puig, 01/01/2019 -30/06/2022, 375.100€ ICMAB.
- Nanoscale coherent hybrid devices for superconducting quantum technologies, **NANOCOHYBRI, EU, COST ACTION**, CA16218, Coord. Hermann Suderow (UAM). PI-ICMAB: Teresa Puig, 18/10/2018-16/04/2022, 500.000€ total cost.
- HTS Coated Conductor for Future Circular Collider beam screen, **HTS-FCCbs, CERN, FCC-GOV-CC-0073**, 01/01/2017-31/12/2019, 1.2 M€ total cost (440 k€ ICMAB) and **HTS-FCCbs II, CERN FCC-GOV-CC-0208 (KE4947/ATS)**, 01/12/2020-31/11/2023, 1.2 M€ total cost (360 k€ ICMAB), Coord/PI Teresa Puig
- Ultrafast growth of ultrahigh performance superconducting tapes, **ULTRASUPERTAPE, EU, H2020- ERC-2014-ADG-669504**, PI. Teresa Puig, 01/12/2015-31/05/2022, 2.496.652€
- Cost effective SC-FCL using advanced superconducting tapes for future HVDC grids, **FASTGRID, EU H2020-NMBP-18-2016-IA**, Coord; Pascal Tixador (CNRS), PI-ICMAB: Xavier Obradors, 01/01/2017-31/11/2020, 726.304€ (7.470K€ total).
- Cost-effective approaches to chemical superconducting conductors and oxide heterostructures for energy challenges, **CoachSupenergy, MAT2014-51778-C2-1-R**, MICINN, PI: Prof. Teresa Puig - Prof. Xavier Obradors, 01/01/2015-31/12/2018, 580.800 €

#### C.4. Contracts, technological or transfer merits

##### Contracts:

- Development of superconductors by chemical solution deposition including nanoparticles on clad type metal substrates and its application for RtoR process development **SUMITMO Electric Industries**, Prof. Teresa Puig, 2021-2023, 250000 €
- Development of UV-curing inks and screen printing pastes focused to superconducting tapes (**SuperInKs**), **RTC-2015-3640-3**. Coordinator: Oxolutia S.L. (industrially leaded), PI: Prof. Teresa Puig, 01/03/2015-31/12/2017, 160.000 €
- Development of piezoelectric films on Cu substrates **La Farga Lacambra SAU**, Prof. Teresa Puig, 01/06/2009-31/03/2013, 40.000€
- Diseño de una nueva generación de generadores y equipos auxiliares para energía eólica basados en superconductores, **WIND GENERATOR, MINECO, RTC-2014-1740-3**, Coord. GAMESA (ICMAB IP: Xavier Granados), 01/02/2014-30/06/2016, 853.592€ (176.315€ ICMAB)

##### Patents:

- Protocols of Transient Liquid Assisted Growth of REBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> films, nanocomposites and Coated Conductors T. Puig X. Obradors, et al, Industrial secret, ref. 67/2021, 15/01/2021
- Superconductor material and process for producing the same, A. Calleja, V.R. Vlad, X. Palmer, X. Obradors, X. Granados, T. Puig, P. Barusco, C. Lacroix and F. Sirois, EP18382760(2018), EP3644381 A1 (2020), EP3644381 B1 (2021)
- Device and method for mapping ferroelectric and /or piezoelectric samples, A. Rodriguez, M. Gich, T. Puig and X. Obradors, PCT PCT/ES2017/070581, 2017
- Superconductor tapes, layers or sheets and method for the production thereof from fluorine free precursor solutions with high growth rates, X. Obradors; T. Puig; S. Ricart; L. Soler; 300139952-PCT/ES2014/070788, WO2016059264A1, Spain, 2014, CSIC. Licensed.
- Fabrication method of epitaxial oxide films from ink jet printing, A. Calleja, M. Vilardell, R. Vlad, X. Obradors, T. Puig, S. Ricart, X. Granados, PCT/ES2014/070534, WO20161454 (A1) ES2601487 (B1) 2017, CSIC, OXOLUTIA, S.L. Licensed.
- Procedure to obtain cerium oxide coatings at low temperatures, X. Obradors, T. Puig, A. Calleja, S. Ricart, M. Aklalouch, P Roura, J. Farjas, PCT201130460, WO2012131130 (A1), ES2389344 (B1) 2013, CSIC, Universitat de Girona.
- Superconducting tapes obtained from metalorganic solution containing two transition metals, X. Obradors, T. Puig, S. Ricart, A. Pomar, A. Palau, F. Martinez, PCT/ES2010/070798, WO2011029976 (A3), ES2355222 (B1) 2012, CSIC. Licensed
- Creation and participation in a Technologically-based spin-off company, OXOLUTIA S.L. 2010-2020