CV JOSE M. TORRALBA

Family name, First name: Torralba, José Manuel

Researcher unique identifier(s): http://orcid.org/0000-0003-2032-4144;
https://scholar.google.es/citations?user=1RcvBwIAAAAJ&hl=es&oi=sra
URL for website:https://sites.google.com/view/jmtorralba/Home

- **Education and key qualifications**

1994 Dr. Eng. (Ceramics). Army's Higher School of Engineering (Madrid/Spain). Supervisor: Prof. José M. Ruiz-Prieto
1986 Armament and Material Engineer. Army's Higher School of Engineering (Madrid/Spain)
1985 Dr. Eng (Powder Metallurgy). School of Mines/ Technical University of Madrid (UPM) (Spain). Supervisor: Prof. Enrique Chacón.
1982 Mining Engineer (Metallurgy). School of Mines/ Technical University of Madrid (UPM) (Spain).

- **Current position(s)**

2021 – present Director. IMDEA Materials Institute/Spain (selected via an international call among more than 30 candidates).
1996 – present Professor of Materials Science and Engineering (MSE). Department of MSE/School of Engineering/Carlos III University, Madrid (UC3M)/Spain. 1st full professor of MSE at UC3M.

- **Previous position(s)**

1983 – 1987 Engineer. Spanish Ministry of Defense/Spain.
1987 – 1996 Associate Professor. Department of Materials Eng./School of Mines/Technical University of Madrid/Spain.

- **Institutional responsibilities**

As Director of IMDEA Materials, I am responsible for the scientific programme, hiring of scientists, general management, and day-to-day management. As Director General of the Madrid Regional Government, I was in charge of all the public university system and the research policies and calls (i.e. I was responsible for the Regional Research Framework Programme). I managed a budget of 1300 M€/year.

2021- present Director of IMDEA Materials Institute.
2021-2023 Vice-president of the Federation of Spanish Scientific Societies (COSCE)
2017-2019 Director-General of Universities and Higher Arts Schools (Madrid Regional Government)
2015-2017 Director-General of Universities and Research (Madrid Regional Government)
2008-2015 Deputy Director of IMDEA Materials Institute
2004-2006 Vice-rector for Research and Innovation at UC3M
2000-2004 Vice-rector for Research Infrastructures at UC3M
1997-2000 Head of MSE Department at UC3M (1st head of Department)
1996-present Founder and group leader of the Powder Technology Group at UC3M
2019-present Founder and group leader of the Sustainable Powder Technologies Group at IMDEA Materials

- **Memberships of scientific societies**

2007 – present American Powder Metallurgy Institute (USA)
2000 – present European Powder Metallurgy Association.

These are the two most important societies in the world on Powder Metallurgy (PM).

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

- **Research achievements**

1) Scientific/technological impact in the field of Powder Metallurgy.

I am the most influential researcher in Spain (among the top five in Europe) in the field of Powder Metallurgy (PM), both from a scientific and technological perspective. I have driven numerous lines of research in PM, covering practically all alloy families and many possible PM forming routes. Currently, there are at least 10 research groups in Spain that are developing research lines initiated by me at UC3M and IMDEA. Below are some of these lines (only those lines where the pioneering aspect of being introduced in Spain for the first time can be highlighted): 1) Sintered Stainless steels. 2) Fe-based hard metals. 3) PM Metal Matrix Composites (Al, Mg). 4) Metal Injection Moulding (MIM). 5) Development of master alloys for the production of low alloy steels. 6) Development of ODS steels for extreme applications by powder metallurgy. 7) New cobalt-based powder metallurgy superalloys for high-temperature applications. 7) Development of high-entropy alloys by PM using mixtures of "commodity" alloys. 8) Nickel-Cobalt-based

high-entropy superalloys. All these lines have been pioneered in Spain and, in some cases, at the European level.

2) Supervisor, mentor, and creator of School.

I have directly supervised 29 doctoral theses and more than 15 postdoctoral researchers. Many of these researchers today form a dense international network with which he maintains links, connecting industry with academia. In my research group (the Powder Technology Group, GTP), more than 60 doctoral theses have been supervised, with a good gender balance (55% men and 45% women) and significant industry projection (50% of graduates in industry). Among them, 10 professors or equivalent positions in international systems and 4 technical or innovation leaders in large companies stand out. The GTP is a great platform for professional projection. In addition to those already mentioned, over 20 GTP alumni hold senior positions in either industry or academia.

3) Principal Investigator

Throughout my career, I have led numerous people, directing numerous projects and enabling many members of my group to lead projects. I have been PI in 35 competitive funded projects (7 international). Returning to the academic world after the period dedicated to political management posed a great challenge as it meant having to "start from scratch" from a research perspective. In the last five years since returning to academia, I have managed to be PI of two National Plan projects, two public-private collaboration projects (Challenges-Collaboration or equivalent), and I have launched the "Sustainable Powder Metallurgy" research group at IMDEA Materials and consolidated a solid structure at UC3M. It is worth noting the achievement of the IRIDISCENTE project (PLEC2023-010190, funded by the Spanish Ministry of Science, Innovation and Universities, MCIN/AEI), led by me, has secured over 9 million euros for a consortium of 8 companies and 4 research centres/universities, being the largest project ever led at IMDEA Materials Institute.

4) Papers published in journals.

377 papers published (5600 cites) in Scopus (Scopus ID 7005264188), 220 as first or main author. In Google Scholar 7950 cites, 13º author in "Powder Metallurgy", 11º in "Sintering", and 2º in "Metal Injection Moulding". I would highlight the following, highly related with CRISYS:

-Torralba, J.M; Kumarán, S V.; "Development of competitive high-entropy alloys using commodity powders", https://doi.org/10.1016/j.matlet.2021.130202. This paper demonstrates, for the first time, the concept of mixing "commodity" alloys to develop a high entropy alloy with high performance properties. In this case were used Fe, Ni and C base superalloys. This paper is highly linked with the concept developed in the proposal.

-Kumaran, S V.; Garbiec, D.; Torralba, J.M.; "A novel and sustainable method to develop non-equiatomic CoCrFeNiMox high entropy alloys via spark plasma sintering using commercial commodity powders and evaluation of its mechanical behaviour", https://doi.org/10.1016/j.msea.2023.145207. High entropy alloys are developed also from commodity alloys and manufactured by advanced PM technologies, with superior mechanical properties.

-Mohammadzadeh, A.; Heidarzadeh, A.; Becker, H.; Robles, J.; Meza, A.; Avella, M.; Monclús, M.A.; Tourret, D.; Torralba, J.M.; "Exploring the Impact of Configurational Entropy on the Design and Development of CoNi-Based Superalloys for Sustainable Applications", https://doi.org/10.1016/j.jallcom.2023.171380. CoNi-base high entropy superalloy concept develoment, including the design methodology, and advanced manufacturing of the selected materials.

-Torralba, J.M.; Iriarte, D.; Tourret, D.; Meza, A. "Using multicomponent recycled electronic waste alloys to produce high entropy alloys". https://doi.org/10.1016/j.intermet.2023.108128 Here, we show that it is possible to obtain competitive HEAs from complex alloy mixtures corresponding to typical electronic waste compositions, by combining computational thermodynamics and phenomenological HEA design principles.

5) Research monographs.

-"Sintering of Superalloys: Processing and Properties". M. Campos, J.M. Torralba, R. Casas, M. Carton-Cordero. Encyclopedia of Materials: Metals and Alloys, 2021, pp. 372–382.

-"Sintering of High-entropy Alloys: Processing and Properties". P Alvaredo, JM Torralba, J.M., A García-Junceda. Encyclopedia of Materials: Metals and Alloys, 2021, pp. 362–371. This monography is highly related with the project topic.

-"Metal injection molding (MIM) of stainless steel". JM Torralba, J Hidalgo, Handbook of Metal Injection Molding, 2019, pp. 409–429. This handbook is the most important one published in the topic.

-"Improvement of Mechanical and Physical Properties in Powder Metallurgy". JM Torralba, Comprehensive Materials Processing (Elsevier), 2014, 3, pp. 281–294.

6) Technology transfer.

Leader of the Powder Technology Group at UC3M in Madrid since 1996, which has been included in the list of Centres of Excellence by the European Powder Metallurgy Association. The group (with an average of 25 members, including PhD students, Postdocs, and tenure staff) has a significant volume of research activity

directly funded by companies (nearly 20% of total income). As Director of IMDEA Materials, I am leading many activities regarding technology transfer (in the last year, the Institute has issued 5 new patents, licensed 1, and launched 1 spin-off). On average, the annual income of projects directly funded by industry is 700 k€.

7) Patents.

Elena Bernardo, Mónica Campos, José Manuel Torralba. "Copper based alloy powder and use therefore"; Application No./Patent No.: EP 14161413.1/ 1353; Date of filing: 25.03.2014; This international patent falls in the scope of the research line developing master alloys to improve the properties in low alloyed PM steels.

8) Höganäs Chair in Powder Metallurgy.

I was the promoter and co-director, for 25 years, of the Höganäs International Chair in Powder Metallurgy, a chair that has been a reference for industrial collaborative work at the European level for more than 25 years. Höganäs AB (the main multinational in the sector) collaborated in this chair with UC3M, the Vienna University of Technology, the University of Trento, and the Institute of Materials Science in Kosice. Under the chair's activity, more than 25 industrial doctoral theses have been developed, 5 of them co-directed by me.

9) Editor of "Scientific Journals" activities.

I am the Co-Editor in chief of "Powder Metallurgy" (SAGE) (the main Journal of the topic in the world) and Regional Editor (Europe) of "Journal Materials Processing Technology" (Elsevier)

Peer recognition

- **Awards**.

First European elected Fellow of the two main powder metallurgy (PM) societies in the world. Gold medal holder of the FEMS (one of the most prestigious awards in MSE in Europe) and Ivor Jenkins Award (by the IOM3, the most prestigious award in Europe in the field of PM). Dr. Honoris Causa by the Technical University of Cluj-Napoca (2001) and the University of Craiova (2007).

2023 Corresponding Member of the Academy of Military Science and Arts of Spain.
2022 Ivor Jenkins Gold Metal of the Institute of Materials, Minerals and Mining (IoM3).
2021 Federation of European Materials Societies (FEMS) Gold Metal.
2017 Fellow of the European Powder Metallurgy Association.
2016 Lifetime Achievement William Johnson International Gold Metal AMPT.
2015 Fellow of American Powder Metallurgy Institute (USA).
2013 European Powder Metallurgy Association (EPMA) Special Service Award.

- **Invited presentations to internationally established conferences and international schools.**

Participation as invited lecturer in the last 12 editions of the European Powder Metallurgy Association Summer Schools (San Sebastián, Trento, Cracow, Sheffield, Valencia, Grenoble, Vienna, Trento, Ciudad Real, Dresden). Scientific/academic coordinator of the Summer School (2012-2015). Invited lectures (last five):

1) "High entropy alloys and powder metallurgy", Plenary Lecture at the 18th International Symposium on Novel and Nano Materials, July 2024, Vienna.
2) "A Sustainable Approach to Developing High-Entropy Alloys Using Commodity Powders: A Proof of Concept Using SPS, PBF-LB/M, and MIM" Keynote lecture at TMS 2024, March 2024, Orlando, USA.
3) "State of the art and the future of metallurgical development" VIP Presenter at the 90th Anniversary of the Danish Metallurgical Society, 24th April, 2023, Kolding, Denmark.
4) "PM Co base superalloys and PM HEAs: beyond Ni-base superalloys for high-temperature applications". Keynote lecture at TMS 2023, March 2023, San Diego, USA.
5) "High Entropy Alloys and Additive Manufacturing" Plenary lecture at 16th International Conference on Nanostructured Materials NANO2022, June 2022, Seville.

- **Organisation of scientific meetings**

Member of the Technical Committee Programme in all EUROPM Conferences since 2013 and in the last PowderMet Conferences (USA) and the PM World Congress in 2014, 2016, 2018 and 2022. Involved (Chairman, Technical Committees,…) in all the Spanish PM conferences and three Latin-American PM conferences (2005, 2007 and 2009).

2022 Co-Chairman of the Technical Committee Programme of the World Congress on Powder Metallurgy (Lyon, France)

2015 and 2001 Chairman of the Advances in Materials and Processing Technologies Conference, AMPT2015 and AMTP2001 (Madrid, Spain).

2003 Co-chairman of International Conference on Processing and Manufacturing of Advanced Materials THERMEC'2003 (Madrid, Spain).

- **Reviewing activities.**

2022 – present Scientific Committee of Research Institute for Higher Education and Science, Carlos III University, Madrid –Autonomous University of Madrid (Spain).
2010 – present Regular reviewer in PhD committees, Professorship panels and Research Funding Agencies in Europe.

ADDITIONAL INFORMATION

- **Career breaks**

During the legislature that ran between 2015 and 2019, I was Director General, first, of Universities and Research (DGUI), and in the second half of the legislature, I was in charge of Universities and Higher Education (DGU). As DGUI, I was responsible for the creation and implementation of the V PRICYT (the Regional Framework Research Programme), and especially for new calls that continue to this day: Talent call (today Cesar Nombela), Assistants and Technicians call, Synergic Projects call, and Industrial Doctorates call. During that period, the PRICYT budget increased from 80 million to 110 million euros. As DGU, I was responsible for drafting the Law of the Madrid Higher Education Space (LEMES), which was approved by the Government Council and ultimately rejected by the Assembly. As DGU, I launched (and financially supported) the Echegaray Program for teaching staff.

- **Teaching activities**

Teaching activity from 1986 at the Technical University of Madrid and from 1996 at Carlos III University. All teaching levels (undergraduate and master). Always MSE topics in Engineering degrees.

- **Divulgation, communication, promoter and opinion leader**

I have always expressed my commitment to scientific outreach and the need to contribute to the national debate on scientific and university policy. Whenever requested, he has participated in forums, roundtable discussions, and debates on scientific and university policy. In the field of scientific outreach, for decades, I have been involved in organizing guided tours for high school and secondary school students to research laboratories, as well as giving talks to these students at their schools and institutes. In this regard, I have also collaborated with the NGO "Solidarios," giving informative lectures on "Materials" in penitentiary centers in the Community of Madrid (approximately once every quarter). I collaborate with "The Conversation - in Spanish -," discussing various topics of current interest in science and materials engineering (I have published 9 articles with 100,000 views so far). I contribute to the RNE1 program "On the Shoulders of Giants" with a regular segment on science and materials engineering. The program's contributions are also compiled into a podcast ("Everything You Wanted to Know About Materials But Were Afraid to Ask"). I also maintain a YouTube channel with lectures and informative "pills" (with 400 subscribers and over 300,000 views). Regarding my involvement in discussions on life and academic policy topics (university, science), I have an active opinion blog ("University Matters") with 74 entries and 23,000 views since 2007. I actively participate in opinion blogs "Universidad Si" and "Espacios de Educación Superior". I have always been concerned about cross-cutting issues related to academic life, and during the pandemic, I organized two series of webinars under the heading "Transversal Reflections During a Pandemic: The Importance of More and Better Science." The conferences are open and accessible through the YouTube channel "Science Reflections" with over 1,300 subscribers and more than 30,000 views. Linked to my interest in cross-cutting topics related to relationships in the academic world are his three publications on "Elsevier Connect": "10 Ingredients for a Successful Supervisor/PhD Student Relationship," "10 Rules to Survive in the Marvelous but Sinuous World of Academia," "12 Conditions to Attract and Retain Talent in Academia."

- **Major collaborations**

Prof. Bern Kieback (retired), TU Dresden/Fraunhofer IFAM, Germany
Prof. Alberto Molinari, Univ. of Trento (Italy).
Prof. Herbert Danninger, TU Wien (Austria).
Prof. Lars Nyborg, University of Chalmers (Sweden).
These collaborations have been developed through collaborative projects, industrial projects, internships and infrastructure sharing, among other activities such as conferences organization.