Section A. PERSONAL INFORMATION

CV date	14/06/2025

Name and Surname	HELENA GAVILAN RUBIO		
ID number	53812123N	Age	34
Researcher Codes	WoS Researcher ID	S-9663-2017	
	Scopus Author ID	57191912898	
	ORCID code	0000-0002-2071-628X	

A.1. Current prosition

Position	Ramón y Cajal (RyC) Researcher		
Initial date	01/01/2023		
Institution	Universidad Complutense de Madrid (UCM)		
Department	Dpt. Physical Chemistry		
Country	Spain	Teleph. number	(+34) 622074316
Keywords	Magnetic nanoparticles, hyperthermia, photothermal therapy, stimuli responsive nanoparticles, colloidal synthesis, medical applications		

A.2. Previous positions (research activity interruptions, see call)

Period	Position/Institution/Country/Interruption cause
2014-2017	Predoctoral contract/ICMM-CSIC/Spain
2018-2020	Postdoc contract/IIT/Italy/Maternity leave
2020-2021	Postdoc contract/IIT/Italy/Award of a Postdoc Fellowship
2021-2022	Postdoc Fellow/UC3M/Spain/ Award of Ramón y Cajal Fellowship

A.3. Education

Bachelor/Master/PhD	University	Year
PhD in Advanced Chemistry	Universidad Complutense de Madrid	2017
Master in Science and Chemical Technology	Universidad Complutense de Madrid	2014
Degree in Chemistry	Universidad Complutense de Madrid	2013

Part B. SUMMARY OF THE CURRICULUM

I hold a PhD in Advanced Chemistry conducted at ICMM-CSIC (Spain), within the *EU FP7 Nanomag project*. My thesis focused on **colloidal synthesis and characterization of magnetic nanoparticles (MNPs) for biomedicine** (supervisors: M. Puerto Morales and L. Gutiérrez; Thesis defense: 10/2017). In 2018–2021, I worked as a Postdoc at IIT (Italy) in Teresa Pellegrino's group, where I gained advanced expertise in MNPs for **magnetic hyperthermia (MHT), phototherapy (PTT), MRI/MPI, and drug delivery**. During this period, I participated in international projects, supervised students, and did a **2-month stay at Lawrence Berkeley National Laboratory (USA)**. In 2021, I joined UC3M with a 3-year Postdoc fellowship in the Polymers and Composites group, **where I developed my own research line on functional MNP-based nanomaterials**. I participated in the "research team" of the granted national project HIPONEA, supervised students, and lectured in English and Spanish. **In 2023, after I was awarded a Ramón y Cajal fellowship, I joined UCM's Physical Chemistry Dept.,** where I lead an emerging research group **as an independent researcher,** serving as the **principal investigator on different national/international projects**, ensuring I can fully support and provide for my team. Worth of note is that I had two maternity leaves in the past (2020 and 2023).

1. Scientific contributions:

My work focuses on the **scalable production of magnetic nanomaterials** for cancer therapy (MHT, multimodal therapies). I have co-authored **30 publications: 11 as first author, 10 as corresponding. I have 2 granted patents**, and **2 book chapters**. It should be highlighted that **3 of my publications have over 100 citations**. My review article about Magnetic nanoparticles and clusters for magnetic hyperthermia **(Chemical Society Reviews, 2021, first/corresponding author)** has over *350 citations.*

Key contributions:

• I developed a gram-scale solvothermal synthesis of ferrite nanocubes with benchmark heating performance **(Nature Protocols, 2023, first/corresponding author)**. The study introduced aldehydes (especially aromatic aldehydes) as shape-directing agents. This work led to two patents and a granted ERC-PoC project (to which I contributed in preparation and execution). This idea contributed to my current National project (AMULET), in which I am exploiting other novel molecules as shape-directing agents.
• I executed a study on how morphology and assembly enhance the MNPs' heat response under AMFs **(Nanoscale, 2021, first author)**, foundational for securing my Singular Facility (AniMAG) and National (AMULET) projects (PI in both). I have recently acquired an inductive magnetometer and a set-up of electromagnets that couple a DF microscope to expand the current knowledge on how morphology and assembly enhance MNPs heat response.
• I recently introduced **novel MXene/MNP nanohybrids for synergistic photomagnetic hyperthermia** (manuscript submitted). As part of my 3-year postdoctoral fellowship at UC3M, I conceived and designed this research project, thus I am corresponding author).
• **I currently lead 3 projects as principal investigator (PI): AMULET (Proyecto de Generación de Conocimiento, 2024–2027), DREAM-Nano (Proyecto Europeo Una Europa, 2025), and AniMAG (Proyecto de infraestructura singular, 2024).** In addition, **I am the leader of working group 3 (WG3)**, synthesis of MPI tracers; and I am a **management committee member (MC member) in the EU COST Action NexMPI (2024-2028)**. I have participated in several projects that are widely recognized as prestigious, highly competitive, and emblematic of research excellence at the European level, including **ERC, ERC-PoC, MSCA-RISE, and other national calls. All in all, I have participated in 10 R&D projects.** Finally, the work of my PhD contributed to ISO 19807 in nanotechnology.

2. Societal contributions:
I **co-founded HyperCube, a start-up at IIT for magnetic nanocubes in nanomedicine**. We secured €327k (ERC-PoC, IIT, IP Booster) and **won two innovation awards in Italy**. I also contributed to a **research contract with Colorobbia Holding SpA**. HyperCube startup project is currently in the fundraising stage. We are actively seeking funding to support the development and initial growth of the business.

3. Training and mentorship:
I've supervised 2 PhDs (1 ongoing), 5 MSc, 4 BSc students, and 2 research technicians (PLI). **I am currently PI and direct a team at UCM (1 PhD, 2 MSc students, 1 research technicians (PLI)).** I lectured different subjects (Chemistry, Physical Chemistry, Materials Science and Engineering, and Nanomedicine, among others) in Degrees/masters at UC3M in the past (2021-2022) and UCM (2023-Present). A former student from UC3M **won the NanODS CIRMAT24 Poster Award for a project I co-directed** (novel MXene/MNP nanohybrids); **my PhD student recently received an STSM grant** (novel MNPs designs for MHT, MPI and MRI) within the NexMPI COST Action. As PI of DREAM-Nano, **I am organizing a funded PhD workshop (Sept. 2025) on nanomedicine at UCM with participation from Una Europa partner universities** (I will fund the trip, accommodation, daily allowance, etc. of 10 Una Europa PhD students from Una Europa Universities: UCD, UZH and JU).

4. Other relevant contributions:
I have given **invited talks at top conferences (E-MRS, INTERMAG)**, **co-organized international (ICPMS) and national (SBAN) symposia**, and serve as **reviewer** for ACS Appl. Mater. Interfaces, Scientific Reports, among others. I am a **member of the RSEQ** (Nanoscience and Colloids groups).

Part C. MOST RELEVANT MERITS

C.1. Selected Publications

1. Gavilán, H.;* Gallo-Cordova, A.; (…) Morales, M. P. and Gutierrez, L. **(2025, Submitted and under review at Nanoscale)** "Magnetic Hyperthermia in Focus: Emerging Non-Cancer Applications of Magnetic Nanoparticles".
2. Shen, Z. P.; Cabanelas, J. C.; (…) **Gavilán, H.*** and Serrano,* M. B. **(2025, Submitted).** "Development of hybrid nanomaterials based MXene/magnetic nanoparticles for photo

magnetic hyperthermia applications".

3. Mandriota, G.; Avugadda, S. K.; Silvestri, N.; Marotta, R.; **Gavilán, H.;** (...) Samia, A. C. S. and Pellegrino, T. **(2025)** "Magnetic Nanosheets: from IONCs to polydomamine embedded 2D clusters and their multi-purpose properties". ***Nanoscale Horiz., 10,1140–1158.*** **Citations = 1.**

4. Mai, B. T.; (…) **Gavilán, H.**, Debellis, D., Gjurgjaj, L. and Pellegrino, T. **(2024)** "Nanoplatforms for Magnetic-Photo-Heating of Thermo-Resistant Tumor Cells: Singular Synergic Therapeutic Effects at Mild Temperature". ***Small 20 (51), 2310522.*** **Citations = 1.**

5. Gavilán, H.,*, Rizzo, G. M. R.; (…) and Pellegrino, T.* **2023** "Scale up approach for the preparation of magnetic ferrite nanocubes and other shapes with benchmark performance for Magnetic Hyperthermia Applications." ***Nature Protocols 18 (3), 783-809.*** **Citations = 58.**

6. Mai, Binh T., (…) **Gavilán, H.,** Di Girolamo, A. and Pellegrino, T. **2022** "Clickable Polymer Ligand Functionalized IONCs: A Promising Nanoplatform for 'local hot spots' Magnetically Triggered Drug Release." ***ACS Appl. Mater. Interfaces 14.43 (2022): 48476-48488.*** **Cit. = 16.**

7. Fiorito, S., Soni, N., Silvestri, N., Brescia, R., **Gavilán, H.**, Conteh, J. S., ... and Pellegrino, T. **(2022)**. Fe_3O_4@Au@ $Cu_{2-x}S$ Heterostructures designed for tri-modal therapy: photo-magnetic hyperthermia/^{64}Cu radio-insertion. ***Small, 18(18), 2200174.*** **Citations = 28.**

8. Gavilán, H.; Simeonidis, K.; (...) Chantrell, R. W.; Balcells, L.; Angelakeris, M.; Morales, M. P. and Serantes, D. **2021** "How size, shape and assembly of magnetic nanoparticles give rise to different hyperthermia scenarios". ***Nanoscale, 2021,13, 15631-15646.*** **Citations = 118.**

9. Gavilán, H.*; Kumar Avugadda, (…) and Pellegrino, T.* **2021** "Magnetic nanoparticles and clusters for magnetic hyperthermia: optimizing their heat performance and developing combinatorial therapies to tackle cancer" ***Chem. Soc. Rev., 2021,50, 11614-11667.*** **Cit. = 384.**

10. Silvestri, N.; **Gavilán, H.**; Guardia, P.; (...) and Pellegrino, T. **2021** "Di- and tri-component spinel ferrites nanocubes: synthesis and their comparative characterizations for theranostic applications" ***Nanoscale, 2021, 13, 13665–13680.*** **Citations = 39.**

11. Roca, A. G., Gutierrez, L., **Gavilán, H.**, (…) and Morales, M. P. **2019**. "Design strategies for shape-controlled magnetic iron oxide nanoparticles." ***Adv. Drug Delivery Reviews 138, 68-104.*** **Citations = 349.**

12. Gavilán, H.; Brollo, M. E. F.; (…) and Morales, M. P. "Controlling the Size and Shape of Uniform Magnetic Iron Oxide Nanoparticles for Biomedical Applications." **CRC Press, 2018. p. 3-24. (eBook ISBN: 9781315168258). Citations=9.**

13. Gavilán, H.,* Sánchez, E. H., Brollo, M. E., Asín, L., Moerner, K. K., Frandsen, C., ... & Gutiérrez, L. (2017). Formation mechanism of maghemite nanoflowers synthesized by a polyol-mediated process. ***ACS Omega, 2(10), 7172-7184***. **Citations=112.**

14. Gavilán, H.,* Kowalski, A., Heinke, D., Sugunan, A., Sommertune, J., Varón, M., ... & Morales, M. P. (2017). Colloidal Flower-Shaped Iron Oxide Nanoparticles: Synthesis Strategies and Coatings. **Part. Part. Syst. Charact, 34(7), 1700094. Citations=106.**

C.2. Congress (Recent Invited talks)

- **Gavilán, H.**; Rizzo, G. M.; & Pellegrino, T. (31/05/2023), (E-MRS SPRING MEETING). Strasbourg, France.
- **Gavilán, H.**, Simeonidis, K., & Serantes, D. (15/05/2023) (INTERMAG). Sendai, Japan.

C.3. Research projects

1. *DREAM-Nano:* Una Europa 2024 Seed Funding call - SF2405_DREAM-Nano "Designing Responsive Advanced Materials for Nanomedicines" (**PI: H. Gavilán**) **2025. 18k€.**
2. Proyectos Generación de Conocimiento 2023 PID2023-150760NA-I00 "DESARROLLO DE HETEROESTRUCTURAS MULTIFUNCIONALES ORDENADAS EN MEDIOS VISCOSOS PARA HIPERTERMIA MEJORADA" (**PI1: H. Gavilán**). **2024-2027. 125k€**
3. *NexMPI:* Cost Action CA23132. "Magnetic Particle Imaging for next-generation theranostics and medical research". (**MC member/Leader of a WG)**. **2024-2028. 520k€.**
4. AniMAG: Exploring the Potential of Anisometric Porous Magnetic Nanoparticles for Magnetic Hyperthermia. (**PI: H. Gavilán, facility project)**. 2023. 4000 €.

5. HIPONEA: Hierarchical Porous Nanofibers for Electrochemical Applications. PI: V. San Miguel (I was in the research team). **Proyecto Nacional**. 2022-2025. **115 k€.**
6. COMPASS: ***H2020-EU.1.3.3- MSCA***, PI: R. Krahne/T. Pellegrino, 2016-2020. 859 k€. (My project was granted and I made a 2-month stay at Lawrence Berkeley National Laboratory).
7. HyperCube: **ERC-2019-PoC**. PI: T. Pellegrino (I helped in the elaboration and execution of the project as senior postdoc), 2020-2021. **150 k€.**
8. ICARO: **H2020-ERC-starting grant**. PI: T. Pellegrino (it funded my Postdoctoral stay at IIT). 2016-2021. **1,160 k€.**
9. NanoMag: **H2020-FP7, 604448**. CSIC-PI: M.P. Morales (it funded my PhD at ICMM-CSIC) 2013-2017. **520 k€.**
10. Nanocristales magneticos mono/multi-nucleo para aplicaciones biomedicas. PI: S. Veintemillas (It funded activities during my PhD). **Proyecto Nacional**. 2015-2018. **150 k€.**

C.4. Participation in knowledge and technology transfer and exploitation of results

Patent 1. T. Pellegrino, **H. Gavilán** and T. B. Mai. Process for the Gram-Scale Preparation of Cubic Ferrite Nanocrystals for Biomedical Applications. Patent WO2020222133 **(published on 05/11/2020)** (under licensing process with a science and technology company).

Patent 2. T. Pellegrino, **H. Gavilán**, G. Rizzo and N. Silvestri. Procedimento per la preparazione alla grammo scala di nanoparticelledi ferrite per applicazioni di ipertermia magnetica. Patent WO 202209031 **(published on 05/07/2022)**.

- ***2019*** Co-founder of “HyperCube”, an IIT start-up to be launched.
- ***2019*** R&D Innovation Project with Colorobbia Holding SpA. 20k € (PI: T. Pellegrino) at IIT.

C.5. Organization of international/national conferences

- Spanish Conference on Biomedical Applications of Nanomaterials (2022-Present).
- 3rd International Conference of Polyol Mediated Synthesis (Spain), June 2018.

C.6. Grants and awards

- ***2022*** 5-year Ramon y Cajal Research Award (Tenure track position)
- ***2021*** 3-year Research Fellowship Programme awarded by the UC3M (Spain).
- ***2020*** B4I Pre-acceleration Programme award, for "HyperCube", Bocconi University (Italy).
- ***2019*** Special award "Marco Paganuzzi" at SMARTCup Liguria competition (Italy).
- ***2019*** Innovative start-up special award "Ricci and Partners" SMARTCup Liguria (Italy).

C.7. International research stays

- ***2019*** Lawrence Berkeley National Labs, California **(USA)**. COMPASS Marie Skłodowska-Curie project). (Duration: 2 months).
- ***2017*** Short-term stay NanoMag project. U. of Shiga Prefecture **(Japan)**. (Duration: 10 days)
- ***2016*** Short-term stay NanoMag project. of UCL **(UK)**. (Duration: 5 days)
- ***2015*** COST action-funded stay. Biosignals group at PTB **(Germany)**. (Duration: 12 days).

C.8. Teaching activities

- ***2023-Present*** Lecturer at UCM (**up to 100 hours p/y**). Subjects taught: General Chem./ Phys. Chem. I/ Phys. Chem. II. (The **tuition language is English and Spanish**)
- ***2021-2022*** Lecturer at UC3M (up to **240 hours** p/y). Subjects taught: Material Science and Engineering and Fundaments of Chemistry to Eng (The **tuition language was English**).

C.9. Evaluator activities and memberships

- Journal reviewer: ACS Applied Materials and Interfaces, Scientific Reports, Materials Today Chemistry, Journal Materials Research, IEEE Transactions on Magnetics Conference and Journal of Magnetism and Magnetic Materials.
- Member of Real Sociedad Española de Química (RSEQ) (Groups of Nanoscience and Molecular Materials, and Colloids and Interfaces).