CURRICULUM VITAE (CVA)
IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

Part A. PERSONAL INFORMATION

First name	Marianella		
Family name	Hernández Santana		
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Open Researcher and Contributor ID (ORCID) (*)	0000-0002-0609-3485		

(*) Mandatory

A.1. Current position

Position	Ramón y Cajal Researcher		
Initial date	01/03/2019		
Institution	Spanish National Research Council CSIC		
Department/Center	Institute of Polymer Science and Technology ICTP		
Country	Spain	Phone number	912587424
Key words	elastomers; self-healing; composite materials; circular economy; rubber waste		

A.2. Previous positions (research activity interuptions, art. 13.2.b))

Period	Position/Institution/Country/Interruption cause
02/2017-02/2019	**Senior Researcher** / Institute of Polymer Science and Technology (ICTP-CSIC) / Spain
05/2016-12/2016	**Post-doc Researcher** / Delft University of Technology / The Netherlands
05/2014-05/2016	**Marie Curie Fellow** / Delft University of Technology / The Netherlands
07/2012-07/2013	**Post-doctoral Researcher** /Institute of Polymer Science and Technology (ICTP-CSIC) / Spain
04/1999-09/2010	**Associate Professor** / Simón Bolívar University / Venezuela

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD: Chemical Sciences	Universidad Complutense de Madrid / Spain	2012
DEA: Physical Chemistry of Macromolecular Materials	Université Louis Pasteur / France	1990
DEGREE: Materials Engineering	Universidad Simón Bolívar / Venezuela	1989

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

1. My scientific activity is focused on the implementation of circular economy principles, using natural polymers and elastomers, favoring their sustainability, increasing their lifetime, and minimizing their waste stream. Some contributions are:

- I developed **natural rubber (NR) nanocomposites** with excellent mechanical and thermal properties that enable the substitution of carbon black in tire formulations (green tire). This work is a benchmark and tire companies like Pirelli and Firestone have shown interest. I also contributed to the generation of knowledge with the **discovery of a new dynamic mode in nanocomposites** due to the restricted segmental dynamics of the elastomeric chains at the rubber/organoclay interfacial regions, which explains their excellent properties.

- I developed for the **first time a NR compound with self-healing capacity**. It was a challenge to obtain a cross-linked network with covalent bonds that can infer self-healing and good mechanical properties. I also introduced dielectric spectroscopy for the first time as an effective technique to monitor the repair of damaged samples at micro- and macroscopic scales. The research provided critical information to understand the role of key repair parameters. In this line, I signed a **R&D contract with Bridgestone Japan** for developing self-healing tires.

- I **pioneered the development of self-healing rubbers with end-of-life tire powder** (GTR). The inclusion of GTR confers a sustainable character contributing, on one hand, to **alleviate the environmental and social problems derived from the contamination of used tires** and, on the other hand, to **increase the lifecycle** of rubbers. Also, I improved the rolling and abrasion resistance, without deterioration in wet grip. This represents a significant accomplishment for the tire industry where the simultaneous optimization of these three characteristics is required. These results are promising and represent a **new alternative for the development of sustainable products for the tire or automotive industries**.

- I have provided **recyclability to a nitrile rubber without negatively affecting its mechanical properties**. This material can easily be scaled-up to pilot and industrial level, targeting two specific applications, **footwear, and automotive parts**. Various companies have shown interest in the scaling-up of this recyclable rubber.

Throughout of my research career I have published 94 peer-reviewed articles in leading international journals and 6 book chapters with **h-index=29 with more than 2900 cites** (source: Scopus). I have acted as leader of 1 research group, participated in **22 national and international research projects**, being **PI of 10 (1.129.248 €)** with funding from public and private sources.

My leadership is demonstrated through the formation of a solid group made up of 5 PhD students, 2 research assistants, 1 lab technician, and various master's and undergraduate students, giving robustness to the self-healing and circular economy research line that I currently lead. I have been awarded the **I3 certification** and participated as **invited speaker in 15 international meetings**.

2. I have participated in **7 industrial contracts being PI in 3** (188.395 €). I participate as **team leader** in the interdisciplinary thematic platform (PTI) of CSIC **SusPlast** "Interdisciplinary Platform for Sustainable Plastics towards a Circular Economy". I am **director of the International Rubber Technology Network** from the Latin-American Society of Rubber Technology (SLTC), and member of the **Governing Board of AEMAC**. I have participated in multiple **outreach activities**, promoting my line of research in **conferences** (Brain Wars and LatinXChem), **press** (CSIC blog "Science to take away", SIGNUS blog, Tire Asia magazine, The Global Catalyst magazine, The Conversation), **digital media** (AEMAC and SLTC Webinars), **radio** (Radio Off The Record) and **television** (RTVE).

3. I have proved a sustained and dedicated commitment to the training of graduate and post-graduate students. I have supervised **5 PhD´s (2 on-going), 12 Master´s and 40 Final Degree projects**. I am participant professor of Master and Doctorate programs (UIMP-CSIC, 2017-present; Universidad de Zaragoza, 2019-present). I have strengthened the collaboration with various international universities (Univ. of Chile, Univ. Simón Bolívar, Univ. Milano-Bicocca, Polytechnic of Milan, Univ. Gdansk, Vrije Univ. Brussel), supervising visiting undergraduate, Master, and PhD students. Currently, I am official peer reviewer of international journals, **Editorial Board Member** of "Polymers" journal (Q1), and **Scientific Editor** (Journal of Composites Science, Polymers and Revista Materiales Compuestos).

4. Other merits include the chair of the 9th International Conference on Self-healing Materials (ICSHM2024) to be held in Madrid in 2024, hosted by CSIC. I was awarded with a PhD thesis "Honorable Mention Award" delivered by the AEMAC. I have consolidated collaborations with various international academic and R&D institutions.

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

C.1. Publications

A total of 94 publications in JCR journals *(IF: impact factor of the year of publication; CA: corresponding author; X/X: author position).* Most recent are:

1. Alonso Pastor et al. Life cycle assessment applied to a self-healing elastomer filled with ground tire rubber, ***Journal of Cleaner Production***, 2023, 419: 138207. (**Q1**, IF: 11.1). **CA; 7/7**.
2. Araujo-Morera et al. Unravelling the effect of healing conditions and vulcanizing additives on the healing performance of rubber networks, ***Polymer***, 2022, 238: 124399. (**Q1**, IF: 4.432). **CA; 4/4.** Total no. of cites: 9.
3. Araujo-Morera et al. Sustainable mobility: The route of tires through the circular economy model, ***Waste Management***, 2021, 126: 309-322. (**Q1**, IF: 7.145). **CA; 4/4.** Total no. of cites: 42. **Open access**.
4. Utrera-Barrios et al. Evolution of self-healing elastomers, from extrinsic to combined intrinsic mechanisms: a review, ***Materials Horizons***, 2020, 7: 2882-2902. (**Q1**, IF: 12.319). **CA; 4/4.** Total no. of cites: 162. **2020 Materials Horizons Outstanding Review Award. Open access**.
5. Utrera-Barrios et al. An effective and sustainable approach for achieving self-healing in nitrile rubber, ***European Polymer Journal***, 2020**,** 139: 110032-110043. (**Q1**, IF: 4.598). **CA; 7/7.** Total no. of cites: 28.
6. Tanasi et al. Thermo-reversible crosslinked natural rubber: A Diels-Alder route for reuse and self-healing properties in elastomers, ***Polymer***, 2019, 175: 15-24. (**Q1**, IF: 4.231). **CA; 2/5.** No. of cites: 74.
7. Araujo-Morera et al. Giving a second opportunity to tire waste: an alternative path for the development of sustainable self-healing styrene–butadiene rubber compounds overcoming the magic triangle of tires, ***Polymers***, 2019, 11, 2122: 1-13. (**Q1**, IF: 3.426) **CA; 2/4.** Total no. of cites: 34. **Open access**.
8. Hernández Santana et al. Routes to make natural rubber heal: a review, ***Polymer Reviews***, 2018, 58: 586-609. (**Q1**, IF: 6.766). **CA; 1/4**. Total no. of cites: 44.
9. Hernández Santana et al. Design of a new generation of sustainable SBR compounds with good trade-off between mechanical properties and self-healing ability, ***European Polymer Journal***, 2018, 106: 273-283. (**Q1**, IF: 3.621). **CA; 1/6.** Total no. of cites: 33.
10. Hernández et al. Monitoring network and interfacial healing processes by broadband dielectric spectroscopy, ***ACS Applied Materials & Interfaces***, 2016, 8: 10647-10656. (**Q1**, IF: 7.504). **CA; 1/4.** Total no. of cites: 42.
11. Hernández et al. Turning vulcanized natural rubber into a self-healing polymer: effect of the disulfide/polysulfide ratio, ***ACS Sustainable Chemistry & Engineering***, 2016, 4: 5776-5784. (**Q1**, IF: 5.951). **CA; 1/6.** Total no. of cites: 157.

C.2. Congress

Participated in more than 90 conferences, with 15 invited and keynote talks at international and national conferences. Most recent talks:

1. Self-healing and recyclable nitrile rubber: a myriad solution for the automotive industry. *International Conference on Self-healing Materials (ICSHM2022)*. Milano, Italy, 2022. **Key note speaker**.
2. Rubber nano(composites) with self-healing capability. *ImagineNano / IC2 Composites 2021*. Bilbao, Spain, 2021. **Invited speaker**.
3. Self-healing natural rubber: a window of massive opportunities for new applications. *Virtual Symposium - 16th edition of the Global Rubber Conference (GRC2020)*. Bangkok, Thailand, 2020. **Invited speaker**.
4. Recent Developments in Self-Healing Rubber Composites. *Online Meeting on Self-healing Materials / GVCSHM-20*. Texas, USA, 2020. **Invited speaker**.
5. Self-healing polymer composites. *7th International Seminar on Modern Polymeric Materials for Environmental Applications – MPM2019*. Cracow, Poland, 2019. **Invited speaker**.

C.3. Research projects

Management and participation in 22 projects: international/EU (9) and national (13). PI: international (2) and national (8). Most recent projects:

1. ***Title and reference number***: Additive manufacturing of natural rubber based materials for sustainable soft robotics (PID2022-143107OB-I00). ***Funding body***: Ministry of Science and Innovation of Spain. ***Participants***: ICTP-CSIC, Vrije Univ Brussel. ***Budget***: 149.500 € (+ 1 FPI). ***Duration***: 09/2023 - 08/2026. ***PIs***: M. Hernández Santana - R. Verdejo.
2. ***Title and reference number***: Una resina termoplástica líquida para nuevos materiales compuestos circulares (TED2021-130201B-C31). ***Funding body***: Ministry of Science and Innovation of Spain. ***Participants***: ICTP-CSIC, Univ. Girona, CIEMAT. ***Budget***: 435.505 €, ICTP: 149.155 €. ***Duration***: 12/2022 - 11/2024. Coordinator: M.A. López Manchado. ***Sub-project PIs***: R. Verdejo - M.A. López Manchado.
3. ***Title and reference number***: Bringing circular economy and sustainability to fiber reinforced polymer composites (SuComp) (PDC2021-120853-I00). ***Funding body***: Ministry of Science and Innovation of Spain. ***Participant***: ICTP. ***Budget***: 149.500 €. ***Duration***: 12/2021 - 11/2023; ***PIs:*** R. Verdejo - M.A. López Manchado
4. ***Title and reference number***: Development of self-healing rubber biocomposites: a sustainable approach (bioHeal) (LINKA20235). ***Funding body***: CSIC. ***Participants***: ICTP, Gdansk University of Technology, University of Wisconsin – Madison, Chalmers University of Technology, Vrije Universiteit Brussel. ***Budget***: 24.000 €. ***Duration***: 01/2021 - 12/2022. ***PI:*** M. Hernández Santana
5. ***Title and reference number***: Self-healing nitrile rubber for high abrasion applications (SHENA)(PID2019-107501RB-I00). ***Funding body***: Ministry of Science and Innovation Spain. ***Participant:*** ICTP***. Budget***: 96.800 €. ***Duration***: 06/2020 - 05/2023. ***PIs:*** M. Hernández Santana – R. Verdejo
6. ***Title and reference number***: Estudio y desarrollo de compuestos elastoméricos autorreparables. Contrato para ayudante de investigación (PEJ-2019-AI/IND-14635). ***Funding body***: Comunidad de Madrid. ***Participant***: ICTP. ***Budget***: 45.000 €. ***Duration***: 03/2020 – 02/2022. ***PI:*** M. Hernández Santana
7. ***Title and reference number***: Desarrollo de compuestos elastoméricos auto-reparables cargados con desechos de neumáticos (PEJ2018-002334-A). ***Funding body***: Ministerio de Ciencia e Innovación. ***Participant***: ICTP. ***Budget***: 35.800 €. ***Duration***: 01/2020 – 12/2021. ***PI:*** M. Hernández Santana
8. ***Title and reference number***: Development of elastomers according to circular economy principles (RYC2017-22837). ***Funding body***: Ministry of Science, Universities and Innovation of Spain. ***Participant***: ICTP. ***Budget***: 308.600 €. ***Duration***: 03/2019 - 02/2024. ***PI:*** M. Hernández Santana
9. ***Title and reference number***: Eco-friendly self-healing rubbers (eco-SHEAR) (MAT2015-73392-JIN). ***Funding body***: Ministry of Economy and Competitiveness of Spain. ***Participant***: ICTP. ***Budget***: 205.700 €. ***Duration***: 02/2017 - 02/2019. ***PI:*** M. Hernández Santana
10. ***Title and reference number***: Multifunctional self-healing elastomers (MUSHE) (FP7-PEOPLE-2013-IEF-623379). ***Funding body***: European Commission. Marie Curie Individual Fellowship. ***Participant***: Delft University of Technology. ***Budget***: 243.850 €. ***Duration***: 05/2014 - 05/2016. ***PI:*** M. Hernández Santana

C.4. Contracts, technological or transfer merits

Management and participation in a total of 7 R&D contracts of special relevance with companies, PI of 3. Most recent are:

1. ***Title***: Automóviles conectados a través de electrónica funcional integrados en componentes fabricados con materiales reciclados y 100% reciclables. ***Company:*** Gonvarri Corporation (Spain). ***Budget***: 108.680 €. ***Duration***: 09/2021-12/2023. ***PI:*** M. A. López Manchado
2. ***Title***: Technical requirements of poly(ethylene vinyl acetate) foams for footwear with non- linear properties under compression load. ***Company:*** Sport & Fashion Management (Singapore). ***Duration***: 08/2021- 07/2022. ***Budget***: 111.150 €. ***PI:*** R. Verdejo
3. ***Title***: Development of self-healing NR compounds. ***Company:*** Bridgestone Corporation (Japan). ***Duration***: 03/2021 -05/2022. ***Budget***: 150.000 €. ***PI:*** M. Hernández Santana
4. ***Title***: Characterization and preparation of rubber blends with end-of-life tires. ***Company:*** Indugarbi NFU´s SL (Spain). ***Duration***: 12/2020 -11/2021. ***Budget***: 6.395 €. ***PI:*** M. Hernández Santana
5. ***Title***: Self-healing elastomers. ***Company:*** Delft University of Technology (Netherlands). ***Duration***: 05/2016 -12/2016. ***Budget***: 32.000 €. ***PI:*** M. Hernández Santana