

Part A. PERSONAL INFORMATION

CV date 11/11/2021

First and Family name	María de los Ángeles Martín Santos		
Social Security, Passport, ID number	807975892	Age	■
Researcher codes	Open Researcher and Contributor ID (ORCID**)	0000-0002-7184-9816	
	SCOPUS Author ID (*)	57204789476	
	WoS Researcher ID (*)	L-9005-2014	

(*) *Optional*

(**) *Mandatory*

A.1. Current position

Name of University/Institution	University of Cordoba		
Department	Inorganic Chemistry and Chemical Engineering. Faculty of Sciences		
Address and Country	Campus Universitario de Rabanales, Ctra. N-IV, km 396. Building Marie Curie (C-3), ground floor. CP/14071, Córdoba, Spain.		
Phone number	957212273	E-mail	ig2masam@uco.es
Current position	Full Professor	From	15/04/2018
Key words	Solid waste; valorisation; wastewater; composting, olfactometry; anaerobic digestion; bioprocesses; modelling; biorefinery		

A.2. Education

PhD, Licensed, Graduate	University	Year
Degree in Chemistry	University of Cordoba	1995
Bachelor Thesis	University of Cordoba	1996
PhD in Chemistry	University of Cordoba	2001

A.3. General indicators of quality of scientific production (see instructions)

Currently, I have **three six-year research periods (sexenios)**, the last one effective from 01/01/2016 and one three six-year-transfer -periods (effective from 01/01/2019). The Unit for the Quality of the Andalusian Universities (UCUA) evaluated my work in the Research, Teaching and Management activities carried out until the evaluation date (2020), granting the maximum possible number (**5 Regional Periods**). Further, I have **five five-year teaching periods (quinquenios)**.

I am co-author of **115 publications** including Articles in indexed journals (**99**), Articles in other specialized national or international journals (8), Books (1) and Book Chapters (7).

Among the articles published in journals, according to the Thomson Reuters Web of Science, **88 are classified the first tertile (of which 67 are in the first decile), another 10 more in the second tertile and 4 in the third tertile**. In addition, with a significant contribution in the field of Research and Innovation, I have participated in 49 projects with companies (principal investigator of 31), an additional value that, however, limits the possibilities of publication on many occasions, although it is framed within the frame of **Transfer of Knowledge**. Transfer of knowledge is also considered to be the presentation of scientific papers in **conferences specialized in the field of study** (112 papers presented in international and national conferences).

All together there are **2738 citations in SCOPUS** with an average of 30 citations per article, 126 citations / year, 89 articles cited on 99 JCR publications. The 10 articles not cited are of very recent publication (almost all 2020) or book chapters that are published in JCR.

My h-index is 30 on SCOPUS and **32** in WOS; with 183 citations in 2015 and 244 in 2016, 217 in 2017, 272 in 2018, 297 in 2019 and 369 so far in 2020, with an average of 243 citations per year in those five years (2015-2019). The papers published between 2015-2019 are all cited in SCOPUS. The normalized impact value (1.33) indicates that the research carried out is above global average.

I have co-directed **13 Doctoral Theses** (all of them qualified with the highest grade, and 4 of them awarded with extraordinary doctoral award). Among the 6 additional theses that are registered, 3 will be finished in the next few months. The rest are in an intermediate stage of development. In addition, during the last 5 years I have supervised 3 Bachelor's Thesis, 39 Final Degree Projects and 12 Final Master's Projects, all of them related, to a different extent, to the subject of the requested project.

Part B. CV SUMMARY (max. 3500 characters, including spaces)

Graduated (Extraordinary Prize) and Doctor in Chemistry at the University of Córdoba in 1995 and 2001, respectively. I have developed my teaching and research work as Assistant Professor, Collaborator Lecturer, Contracted Lecturer and Associate Professor, until I reached the position of Full Professor of Chemical Engineering at the University of Córdoba in April 2018. I carried out postdoctoral research stays at the University of Southampton (England) between 2006 and 2008, in a group led by Professor Charles Banks. In recent years I carried out a short stay at the University of Kenitra (Morocco), due to scientific collaborations financed with international projects that we maintain. In fact, it is currently frequent to host students from such University in our laboratories (I am co-supervising two PhD Thesis).

The research I carry out is fundamentally focused on organic waste, within to research lines: its treatment and recovery and, more recently, evaluation of odor impact. I started my research with the study of wastewater treatment from different agri-food industries, applying different technologies for biological and/or physical-chemical treatments.

However, within the idea of recovery, I have also participated in other studies such as the production of organic amendment from the organic fraction of urban solid waste, excess sludge from urban treatment plants and other agricultural waste. More recently, included within the field of environmental impact study, I have oriented my efforts to evaluate the odorous effects that these treatments have on the nearest populations: the nature of the emissions in relation to the agent that produces them.

Without deriving myself from the issue of organic waste, but with waste of a very different nature, I began the study of Biodiesel production, coinciding with the increasing production that the subsidies to renewable energies motivated. The study of biodiesel production resulted in the start-up of a new manufacturing facility in the province of Seville.

I have worked on the optimization of processes, generally related to energy and the environment. It is worth noting the desulfurization capacity of coal combustion gases (of which a complete thesis was developed in collaboration with the Puente Nuevo Thermal Power Plant), or changes in the current energy concept such as hybridizations of fossil energy with renewables.

More recently, I have collaborated in the development of some studies related to microalgae for wastewater treatment, production of biofertilizers and high-value products. These studies are possible on many occasions due to the multiple contracts with private companies that demand knowledge of the university due to lack of means to carry out R + D + i. Within this activity we have participate in projects with a budget higher than one and a half million euros.

I work as an evaluator for scientific journals, as an ANEP evaluator and the appointment as Expert in National Commissions for the Evaluation and Monitoring of Projects. EQA evaluator.

Parallel to the research work, I have developed my teaching work of subjects in the previous studies of Bachelor's Degree and now the Degree in Environmental Sciences (field in which I mainly develop my research). I have also participated in several doctoral programs of science and engineering. I am currently a PEvAU speaker in Chemistry and Academic Director of the Expert Course in University Education called Radioactive Waste Management, offered by UCO.

Part C. RELEVANT MERITS (sorted by typology)

C.1. Publications (see instructions)

(1) Márquez, P., Benítez, A., Hidalgo-Carrillo, J., Urbano, F.J., Caballero, A., Siles, J.A., Martín, M.A. (2021). Simple and eco-friendly thermal regeneration of granular activated carbon from the odour control system of a full-scale WWTP: Study of the process in oxidizing atmosphere. **Sep. Purif. Technol.** 255: 117782. DOI: 10.1016/j.seppur.2020.117782

(2) Márquez, P., Benítez, A., Caballero, A., Siles, J.A., Martín, M.A. (2021). Integral evaluation of granular activated carbon at four stages of a full-scale WWTP deodorization system. **Sci. Tot. Environ.**, 754: 142237. DOI: 10.1016/j.scitotenv.2020.142237.

(3) Reyes, J., Toledo, M., Michán, C., Siles, J.A., Alhama, J., Martín, M.A. (2020). Biofiltration of butyric acid: Monitoring odor abatement and microbial communities. **Environ. Res.**, 190: 110057. DOI: 10.1016/j.envres.2020.110057.

(4) Toledo, M., Gutiérrez, M.C., Peña, A., Siles, J.A., Martín, M.A. 2020. Co-composting of chicken manure, alperujo, olive leaves/pruning and cereal straw at full-scale: Compost quality assessment and odour emission. **Proc. Saf. & Environ. Protect.**, 139: 362-370. DOI: 10.1016/j.psep.2020.04.048

- (5) Toledo, M., Siles, J.A., Martín, M.A. 2018. Multivariate analysis and biodegradability test to evaluate different organic wastes for biological treatments: Anaerobic co-digestion and co-composting. **Waste Manage.**, 78, 819-828. DOI: 10.1016/j.wasman.2018.06.052
- (6) Toledo, M., Gutiérrez, M.C., Siles, J.A., García-Olmo, J., Martín, M.A. 2018. Chemometric analysis and NIR spectroscopy to evaluate odorous impact during the composting of different raw materials. **J. Clean. Prod.**, 167, 154-162. DOI: 10.1016/j.jclepro.2017.08.163
- (7) Gutiérrez, M.C., Siles, J.A., Diz, J., Chica, A.F., Martín, M.A. 2017. Modelling of composting process of different organic waste at pilot scale: biodegradability and odor emissions. **Waste Manage.**, 59: 48-58. DOI: 10.1016/j.wasman.2016.09.045
- (8) González, Inmaculada; Robledo-Mahon, Tatiana; Andrea Silva-Castro, Gloria; et al. 2016. Evolution of the composting process with semi-permeable film technology at industrial scale. **J. Clean. Prod.**, 115: 245-254. DOI: 10.1016/j.jclepro.2015.12.033
- (9) Gutierrez, M. C.; Martin, M. A.; Pagans, E.; et al. 2015. Dynamic olfactometry and GC-TOFMS to monitor the efficiency of an industrial biofilter. **Sci. Tot. Environ.**, 512: 572-581. DOI: 10.1016/j.scitotenv.2015.01.074
- (10) Gutiérrez, M. C.; Martin, M. A.; Serrano, A.; et al. 2015. Monitoring of pile composting process of OFMSW at full scale and evaluation of odour emission impact. **J. Environ. Manage.**, 151: 531-539. DOI: 10.1016/j.jenvman.2014.12.034

C.2. Research projects

1. **Title:** INTEGRATION OF IOT IN OPTIMIZING URBAN WASTE COLLECTION BASED ON ODOROUS IMPACT
Financing Entity: MINECO. **Call:** 2021. **Call:** 2018. **Principal Investigator:** M.A. Martín Santos and José Ángel Siles **Affiliation:** University of Córdoba. **Period of application:** 01/09/2021-31/08/2024. **Quantity:** € 217,800.00.
Type of participation: Principal Investigator
2. **Title:** Chemical, biological and energy strategies to promote sustainability in the integral water cycle and urban solid waste plants **Financing Entity:** FEDER Andalucía 2014-2020. **Call:** 2018. **Principal Investigator:** M.A. Martín Santos and Carmen Michán Doña. **Affiliation:** University of Córdoba. **Period of application:** 13/01/2020. **Quantity:** € 35,000.00. **Type of participation:** Principal Investigator.
3. **Reference:** CTM2017-88723-R. **Title:** FAST QUANTIFICATION OF VOLATILE ORGANIC COMPOUNDS, FUNDAMENTALLY ODOROUS, EMITTED BY ORGANIC WASTE **Financing Entity:** MINECO. **Call:** 2017. **Principal Investigator:** M.A. Martín Santos and Jose Angel Siles. **Affiliation:** University of Córdoba. **Period of application:** 01/01/2018 - 30/12/2020. **Quantity:** € 231,110.00. **Type of participation:** Researcher.
4. **Reference:** CTQ2014-60050-R. **Title:** IMPACT OF ODORIFEROUS EMISSIONS FROM WASTE MANAGEMENT PLANTS. EVALUATION AND IMPROVEMENT **Financing Entity:** MINECO. **Call:** 2014. **Principal Investigator:** M.A. Martín Santos. **Affiliation:** University of Cordoba. **Period of application:** 01/01/2015 - 30/12/2017. **Quantity:** € 166,980.00. **Type of participation:** Researcher.
5. **Reference:** CTM2011-26350. **Title:** ANAEROBIC CODIGESTION OF AGROINDUSTRIAL WASTE. **Financing Entity:** MICCIN. **Call:** 2011. **Principal Investigator:** M.A. Martín Santos. **Affiliation:** University of Cordoba. **Period of application:** 01/01/2012 - 30/12/2014. **Quantity:** € 131,89000. **Type of participation:** Researcher.
6. **Reference:** AECID-PCI D/024687/09+D/030888/10+A1/039699/11 **Title:** Strengthening of "Laboratoire de Biotechnologie, environnement et qualité" in terms of organic waste. **Financing Entity:** Ministry of Foreign Affairs. **Call:** 2009-10-11. **Principal Investigator:** A.F. Chica Pérez. **Affiliation:** University of Cordoba. **Period of application:** 17/01/2010 - 12/06/2013. **Quantity:** € 219,000.00. **Type of participation:** Principal Investigator.

C.3. Contracts, technological or transfer merits

1. **Title:** Study of the odoriferous impact of different WWTPs located in the Algarve. **Company:** ACCIONA AGUA (PORTUGAL). **Principal investigator:** M.A. Martín Santos and M. Carmen Gutiérrez Martín. **Affiliation:** University of Córdoba. **Period of application:** 02/2021-05/2021. **Quantity:** 9.036,29 €.
2. **Title:** Determination of the most favorable conditions for co-composting of alpeorujo. **Company:** COVIDESA SCA. **Principal investigator:** M.A. Martín Santos and M. Carmen Gutiérrez Martín. **Affiliation:** University of Córdoba. **Period of application:** 2020 - 2023. **Quantity:** 45.406,16 €.
3. **Title:** Odorous impact of the possible WWTP located between posadas and the Rivero de Posadas district. **Company:** Ayuntamiento de Posadas **Principal investigator:** M.A. Martín Santos and M. Carmen Gutiérrez Martín. **Affiliation:** University of Córdoba. **Period of application:** 2021. **Quantity:** 3.373,00 €.
4. **Title:** Advice, Transfer, Training and Optimization of the analytical and methodological techniques necessary for the determination of SARS Cov 2 in water and sludge, in EMASESA laboratories. **Company:** EMASESA **Principal**

investigator: Carmen Michán Doña and M.A. Martín Santos. **Affiliation:** University of Córdoba. **Period of application:** 20/07/2020 - 28/02/2021 **Quantity:** € 48,027.04

5. Title: Quantitative detection of the SARS-COV-2 virus in the wastewater of the Córdoba sanitation network as an early warning indicator of the spread of Covid-19 **Company:** EMACSA **Principal investigator:** Juan José Garrido, Carmen Michán y M.A. Martín Santos. **Affiliation:** University of Córdoba. **Period of application:** 01/06/2020 - 28/02/2022 **Quantity:** € 232.33536

6. Title: Collaboration in the Project "Nutrients and regenerated water recycling in WWTPS through twin-layer microalgae culture for biofertilizers production (LIFE13 ENV/ES/00800, LIFE+ TL-BIOFER)". **Company:** BIOMASA PENINSULAR SA. **Principal investigator:** M.A. Martín Santos and José Ángel Siles. **Affiliation:** University of Córdoba. **Period of application:** 02/12/2016 - 01/10/2018. **Quantity:** € 33,638.00.

7. Title: Diagnosis of the functioning of the anaerobic treatment of AB Mauri vinasse and involvement in the purification process of WWTP La Golondrina **Company:** EMACSA **Principal investigator:** M.A. Martín Santos. **Affiliation:** University of Córdoba. **Period of application:** 01/05/2018 **Quantity:** € 7,000.00

8. Title: SOLAR - FOSIL hybridization study to improve the sustainability of conventional thermoelectric plants **Company:** EON Energía **Principal investigator:** M.A. Martín Santos. **Affiliation:** University of Córdoba. **Period of application:** 02/12/2016-30/09/2018 **Quantity:** € 21,800.00

9. Title: Effect of microwave pretreatment on the anaerobic digestion process of excess active sludge from sewage treatment plants: studies in semi-continuous regime at laboratory and pilot scales. **Company:** EMASESA. **Principal investigator:** M.A. Martín Santos and J.Á. Siles López. **Affiliation:** University of Córdoba. **Period of application:** 01/02/2014 – 28/02/2015. **Quantity:** € 84,216.00.

10. Title: Conditioning and reuse of sludge from wastewater treatment plants in the province of Córdoba. **Company:** EMPROACSA. **Principal investigator:** A. Martín Martín. **Affiliation:** University of Córdoba. **Period of application:** 08/10/2010 - 27/02/2015. **Quantity:** € 155,620.00.

C.4. Patents

1. Authors: Aguado Ramos, M.; Martín Martín, A.; Chica Pérez, A.F.; Martín Santos, M.A.; Siles López, J.A.; Berrios Caballero, M. **Reference:** P200700462. **Title:** Procedure for obtaining squalene. **Priority countries:** PCT. **Date:** 2007. **Owner:** Area of Chemical Engineering (UCO). **Exploitation:** PRADOMUDO S.L.

2. Authors: Aguado Ramos, M.; Martín Martín, A.; Chica Pérez, A.F.; Martín Santos, M.A.; Siles López, J.A.; Berrios Caballero, M. **Reference:** P200701369. **Title:** Procedure for obtaining squalene **Priority countries:** PCT. **Date:** 2007. **Owner:** Area of Chemical Engineering (UCO). **Exploitation:** PRADOMUDO S.L.

C.5. Awards

Chelonia Foundation Award. Recycling, reusing and reducing: Chemical, biological and energy strategies for sustainability in the integral water cycle". II Edition contest Mares Circulares. Aid to 2019 research projects. Chelonia Foundation. 2020. € 5,400.

Knowledge Transfer Award granted by the Social Council of the University of Córdoba. Córdoba July 7, 2009.

GAGO Foundation, EMASESA Y TECNOLOGÍA DEL AGUA Award for the work entitled: Anaerobic digestion of wastewater derived from orange peel. Seville 2007.

TRANSFER 2007 Award from the University of Córdoba to the project "Recovery and valorization of by-products resulting from the production of Biodiesel" (07TTT-425)

TRANSFER 2008 Award from the University of Córdoba to the project "Study in a pilot plant of the energy recovery of the residue derived from orange processing (pulp and peel).

Prize for the best scientific work on urban solid waste treatment granted by the International University of Andalusia and RESUR (in collaboration with: Gutiérrez M^a C., Corredra AB, Chica, AF, Rosal A., Martín M^a A., Dios M., Arcos M^a A., Siles JA, and Martín A.) Call 2009.

All this without counting the **four Doctoral Theses extraordinary Doctorate awards (4/10 defended)** in the Engineering and Architecture Branch of the University of Córdoba.