

Part A. PERSONAL INFORMATION

CV date	Sept-28-2021
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First and Family name	Ricardo Alcántara Román		
Social Security, Passport, ID number		Age	■
Researcher codes	Open Researcher and Contributor ID (ORCID**)	0000-0002-6364-6728	
	SCOPUS Author ID (*)	7005223575	
	WoS Researcher ID (*)	K-2463-2014	

A.1. Current position

Name of University/Institution	Universidad de Córdoba		
Department	Química Inorgánica e Ingeniería Química (Área de Q. Inorgánica)		
Address and Country	Campus universitario de Rabanales, edificio C3, 1ª planta. Spain		
Phone number	957218568	E-mail	ralcantara@uco.es
Current position	Catedrático de Univ. (full prof.)	From	2016
Key words	Batteries; inorganic materials; electrochemistry; energy storage		

A.2. Education

PhD, Licensed, Graduate	University	Year
PhD	Córdoba	1998
Licensed	Córdoba	1993

A.3. General indicators of quality of scientific production

Nº OF SIX-YEAR TERMS POSITIVELY EVALUATED: 4 (the last one on Jan./01/2018).

Nº OF Ph. D. THESIS SUPERVISED (2010-2020): 4.

NUMBER OF PUBLICATIONS (2010-2020): 61 (WoS, Nov-23-2020).

SUM OF TIMES CITED (2010-2020): 1,175 (WoS, Nov-23-2020).

AVERAGE CITATIONS PER ITEM (2010-2020): 19.26 (WoS, Nov-23-2020).

h-Index (2010-2020): 21 (WoS, Nov-23-2020).

h-Index (1996-2020): 37 (WoS, Nov-25-2020).

NUMBER OF PUBLICATIONS IN THE LAST FIVE YEARS (2016-2020): 24 (WoS, Nov.-26-2020).

AVERAGE NUMBER OF CITATIONS/ARTICLE IN THE LAST FIVE YEARS (2016-2020): 21.83 (WoS, Nov.-26-2020).

TOTAL NUMBER OF PUBLICATIONS (1996-2020): 149 (WoS, Nov-25-2020).

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

R. Alcántara (RA) completed his European Ph.D. thesis in 1998, including a three-month stay in Bulgarian Academy of Science, and Extraordinary Ph. D. Theses Award by Cordoba University (Spain) in the Area of Sciences. In Bulgaria, RA was introduced to the world of EPR. The main topic of the Ph. D. theses was the layered materials for the positive electrode of Li-ion batteries. He anticipated the stoichiometry $\text{LiA}_{0.16}\text{Ni}_{0.71}\text{Co}_{0.13}\text{O}_2$, a type material used nowadays in commercial Li-ion batteries [Alcántara et al., Inorg. Chem. 37 (1998) 264, <https://doi.org/10.1021/ic9707220>]. Then, he worked as a postdoctoral researcher in SAFT and University of Montpellier (France) for more than two years. In SAFT he received industrial training on NiMH batteries and contributed to study the decrepitation of the electrode materials by impedance spectroscopy. In Montpellier, RA learned to use Mössbauer spectroscopy and contributed to the implementation there of the techniques and methods for the research about non-aqueous batteries. After obtaining several grants, including *Ramon y Cajal*, and several positions at Cordoba University, he is Full Professor of Inorganic Chemistry since 2016.

Concerning, the teaching activities, his number of five-year terms positively evaluated is three (the last one on jan.-1-2016). In the international master Materials for Energy storage and Conversion (Erasmus mundus), RA taught for the period from 2006 to 2016. In the last

few years his teaching activity is mainly centered in the degrees in Chemistry and Biochemistry.

For 25 years the research activity of RA has been focused on materials for batteries, publishing around 150 works in this field. He has been the main researcher of two national research projects (MAT2014-56470-R and CTQ2008-03192). RA has directed a total of seven Doctoral Theses. The Hirsch index of RA is $h=37$, and he has been cited a total of 4,633 times (without self-citations). The number of communications to conferences is around 90. His most cited article (402 times) is: *NiCo₂O₄ spinel: First report on a transition metal oxide for the negative electrode of sodium-ion batteries*, Chem. Mater. 14 (2002) 2847, DOI: 10.1021/cm025556v. In the last five year his research activities have been mainly focused in the rechargeable batteries based on multivalent ions, such as magnesium, and progressing in the knowledge of the reaction mechanisms in post-Li batteries.

Part C. RELEVANT MERITS (sorted by typology)

C.1. Selected publications

- A. Medina, A. I. Rodríguez, C. Pérez-Vicente, R. Alcántara. Magnesium deintercalation from the spinel-type $\text{MgMn}_{2-y}\text{Fe}_y\text{O}_4$ ($0.4 \leq y \leq 2.0$) by acid-treatment and Electrochemistry. Chemistry - A European Journal. DOI: 10.1002/chem.202101700.
- A. Medina, A. I. Rodríguez, C. Pérez-Vicente, R. Alcántara. Testing the reversible insertion of magnesium in a cation-deficient manganese oxy-spinel through a concentration cell. Dalton Transactions 50 (2021) 2123-2130.
- M. Cabello, A. Medina, R. Alcántara, F. Nacimiento, C. Pérez-Vicente, J. L. Tirado. A theoretical and experimental study of hexagonal molybdenum trioxide as dual-ion electrode for rechargeable magnesium battery. Journal of Alloys and Compounds 831 (2020) 154795.
- M. Cabello, F. Nacimiento, R. Alcántara, P. Lavela, C. Pérez-Vicente, J. L. Tirado. Applicability of molybdate as an electrode material in calcium batteries: a structural study of layer-type Ca_xMoO_3 . Chemistry of Materials 20 (2018) 5853-5861.
- F. Nacimiento, M. Cabello, R. Alcántara, P. Lavela, José L. Tirado. NASICON-type $\text{Na}_3\text{V}_2(\text{PO}_4)_3$ as a new positive electrode material for rechargeable aluminium battery. Electrochimica Acta. Electrochimica Acta 260 (2018) 798-804.
- M. Cabello, R. Alcántara, F. Nacimiento, P. Lavela, M.J. Aragón, J.L. Tirado. $\text{Na}_3\text{V}_2(\text{PO}_4)_3$ as electrode material for rechargeable magnesium batteries: a case of sodium-magnesium hybrid battery. Electrochimica Acta 246 (2017) 908-913.
- J. R. González, R. Alcántara, J. L. Tirado, A. J. Fielding, R. A. W. Dryfe. Electrochemical interaction of few-layer molybdenum disulfide composites vs sodium: new insights on the reaction mechanism. Chemistry of Materials 29 (2017) 5886-5895.
- M. Cabello, F. Nacimiento, J.R. González, G. Ortiz, R. Alcántara, P. Lavela, C. Pérez-Vicente, J.L. Tirado. Advancing towards a veritable calcium-ion battery: CaCo_2O_4 positive electrode material. Electrochemistry Communications 67 (2016) 59-64.
- M. Cabello, R. Alcántara, F. Nacimiento, G. Ortiz, P. Lavela, J.L. Tirado. Electrochemical and chemical insertion/deinsertion of magnesium in spinel-type MgMn_2O_4 and $\lambda\text{-MnO}_2$ for both aqueous and non-aqueous magnesium-ion batteries. CrystEngComm 17 (2015) 8728-8735.
- J.R. González, E. Zhecheva, R. Stoyanova, D. Nihtianova, P. Markov, R.R. Chapuis, R. Alcántara, F. Nacimiento, J.L. Tirado, G.F. Ortiz. A fractal-like electrode based on double-wall nanotubes of anatase exhibiting improved electrochemical behaviour in both lithium and sodium batteries. Phys. Chem. Chem. Phys. 17 (2015) 4687-4695.
- R. Menéndez, P. Alvarez, C. Botas, F. Nacimiento, R. Alcántara, J.L. Tirado, G.F. Ortiz. Self-organized amorphous titania nanotubes with deposited graphene film like a new heterostructured electrode for lithium ion batteries. Journal of Power Sources 248 (2014) 886-893.
- U.G. Nwokeke, R. Alcántara, J.L. Tirado, R. Stoyanova, M. Yoncheva, E. Zhecheva. Electron Paramagnetic Resonance, X-ray diffraction, Mössbauer spectroscopy, and electrochemical studies on nanocrystalline FeSn_2 obtained by reduction of salts in tetraethylene glycol. Chemistry of Materials 22 (2010) 2268-2275.

C.2. Selected research projects

- *Busqueda de baterías seguras y sostenibles basadas en los conceptos Na-ion, Mg e híbrido* (MAT2017-84002-C2-1-R). MAIN RESEARCHER: Gregorio Ortiz Jiménez / Carlos Pérez Vicente. FROM 2018 TO 2020.
- *Baterías post ion litio: del sodio al aluminio* (MAT2014-56470-R). Ministerio de Economía y Competitividad. FROM 01-01-2015 TO 31-12-2017. MAIN RESEARCHER: Pedro Lavela Cabello / Ricardo Alcántara Román. 150.000 € (direct cost); total cost = 181.500,00 €.
- *Hacia una batería ion-Li de estado sólido: materiales nanoestructurados obtenidos por vía electroquímica* (MAT2011-22753). Ministerio de Ciencia e Innovación. FROM 01-01-2012 TO 30-06-2015. MAIN RESEARCHER: José Luis Tirado Coello. COST: 280.000,05 €.

C.3. Contracts, technological or transfer merits

- My Ph. D. ex-student Dr. M. Cabello is working as a postdoctoral researcher in CIC-Energigune (Álava) since 2019.
- My Ph. D. ex-student Dr. J. R. González is associate professor in the Department of Electrical Engineering (Córdoba) since 2020-sept.

C.4. Patents

International publication number: WO 2011/124644 A1. DATE: October-13-2011. TITLE: Composite negative material comprising a transition metal malonate. INVENTORS: J.L. Tirado Coello, P. Lavela Cabello, C. Pérez Vicente, R. Alcántara Román, B. León Mohedano, M.J. Aragón Algarra. OWNER: Universidad de Córdoba.

C.5, SUPERVISOR OF Ph. D. THESIS (FROM 2010 TO 2020)

- TITLE: *Preparación de nanomateriales y uso en (micro)-baterías de litio y post-ion litio*. STUDENT: Marta Cabello. SUPERVISOR: Ricardo Alcántara, Gregorio Ortiz. YEAR: 2018.
- TITLE: *Nanomateriales estructurados obtenidos mediante electroquímica y sonoquímica y su aplicación como electrodos de baterías de iones alcalinos*. STUDENT: José Ramón González. YEAR: 2015. SUPERVISOR: J. L. Tirado, R. Alcántara.
- TITLE: *Nuevos materiales híbridos para electrodo negativo en baterías de ión-litio basados en compuestos de estaño o titanio modificados con carbono o poliácridonitrilo*. DOCTORANDO: Francisco José Nacimiento. YEAR: 2013. SUPERVISOR: P. Lavela, R. Alcántara.
- TITLE: *Development of nanoparticulate forms of tin-based alloy materials for high energy density anodes in lithium-ion batteries*. STUDENT: Uche Nwokeke. YEAR: 2012. SUPERVISOR: J. L. Tirado, R. Alcántara.

C.6, SUPERVISOR OF VISITORS

- Ph. D. student Carmen Miralles Gómez. University of Alicante (UAEEBB2019-10). YEAR: 2020.

C.7. EVALUATOR OF RESEARCH PROJECTS

- Collaborator of *Agencia Nacional de Evaluación y Prospectiva* (ANEP) since 2009.
- Evaluator of projects H2020, European Commission. Year: 2019.
- Evaluator of research projects of other countries: Argentina and Bulgaria.

C.8. PUBLICATIONS IN COLLABORATIONS WITH OTHER COUNTRIES (FROM 2010 TO 2020)

- J. R. González, R. Alcántara, J. L. Tirado, A. J. Fielding, R. A. W. Dryfe. Electrochemical interaction of few-layer molybdenum disulfide composites vs sodium: new insights on the reaction mechanism. *Chemistry of Materials* 29 (2017) 5886-5895.
- M. Cabello, X. Bai, T. Chyrka, G.F. Ortiz, P. Lavela, R. Alcántara, J.L. Tirado. On the reliability of sodium co-intercalation in expanded graphite prepared by different methods as anodes for sodium-ion batteries. *Journal of the Electrochemical Society* 164 (2017) A3804-A3813.
- M. Cabello, T. Chyrka, R. Klee, M.J. Aragón, X. Bai, P. Lavela, G.M. Vasylenko, Alcántara, J. L. Tirado, G.F. Ortiz. Treasure Na-ion anode from trash coke by adept electrolyte selection. *Journal of Power Sources* 347 (2017) 127-135.

- G.F. Ortiz, P. Lavela, P. Knauth, T. Djenizian, R. Alcántara, J.L. Tirado. in-based composite materials fabricated by anodic oxidation for the negative electrode of Li-ion batteries. *Journal of The Electrochemical Society* 158 (2011) A1094-A1099.
- U.G. Nwokeke, A.V. Chadwick, R. Alcántara, M. Alfredsson, J.L. Tirado. Nanocrystalline $\text{Fe}_{1-x}\text{Co}_x\text{Sn}_2$ solid solutions prepared by reduction of salts in tetraethylene glycol. *Journal of Alloys and Compounds* 509 (2011) 3074-3079.
- U.G. Nwokeke, R. Alcántara, J.L. Tirado, R. Stoyanova, M. Yoncheva, E. Zhecheva. Electron Paramagnetic Resonance, X-ray diffraction, Mössbauer spectroscopy, and electrochemical studies on nanocrystalline FeSn_2 obtained by reduction of salts in tetraethylene glycol. *Chemistry of Materials* 22 (2010) 2268-2275.

C.9. CHAPTERS OF BOOKS (FROM 2010 TO 2020)

- R. Alcántara, P. Lavela, G. Ortiz, J. L. Tirado. *Carbon Nanomaterials for Advanced Lithium and Sodium-ion Batteries*. BOOK: Carbon Based Nanomaterials for Advanced Thermal and Electrochemical Energy Storage and Conversion. CHAPTER: 13. PAGES: 335-355. EDITORS: Rajib Paul, Vinodkumar Etacheri, Yan Wang, Cheng-Te Lin. Elsevier (2019). ISBN: 978-0-12-814083-3.
- G. Ortiz, P. Lavela, R. Alcántara, J.L. Tirado. *Recent Advances in Multidimensional Electrode Nanoarchitecturing for Lithium-Ion and Sodium-Ion Batteries*. BOOK: Electrochemical Nanofabrication Principles and Applications (2nd Edition). Chapter 10. Copyright © 2016 Pan Stanford Publishing Pte. Ltd. PAGES: 365-392. EDITOR: Di Wei. ISBN: 978-981-4613-86-6 (Hardcover), 978-981-4613-87-3 (eBook).
- R. Alcántara, P. Lavela, C. Pérez-Vicente, J.L. Tirado. *Applications of Mössbauer spectroscopy in the study of lithium battery materials*. BOOK: Mössbauer Spectroscopy: Applications in Chemistry, Biology, Industry, and Nanotechnology. Wiley (2013). Chapter 28. PAGES: 552-563. EDITORS: V.K. Sharma, G. Klingelhofer, T. Nishid.
- G. Ortiz, R. Alcántara, P. Lavela, J.L. Tirado. *Nanoscale tin heterostructures for improved energy storage in lithium batteries*. BOOK: Nanotechnology for sustainable energy. ACS Symposium Series, vol. 1140 (2013). PAGES: 1-22. EDITOR: Y. Hu. ISBN: 978-0-8412-2813-9.
- R. Alcántara, P. Lavela., C. Pérez-Vicente, J.L. Tirado. *Anode materials for lithium-ion batteries*. BOOK: Lithium-ion batteries. Advanced Materials and Technologies. CRC Press (2012). PAGES: 97-146. EDITORS: X. Yuan, H. Liu, J. Zhang. ISBN: 978-1-4398-4128-0.
- R. Alcántara, P. Lavela., C. Pérez-Vicente, J.L. Tirado. *Nanostructured electrodes for lithium-ion batteries*. BOOK: Solid State Electrochemistry II. Wiley-VCH, Weinheim, Germany (2011). PAGES: 383-407. EDITOR: V.V. Kharton. ISBN 978-3-527-32638-9.

C.10. SELECTED COMMUNICATIONS TO CONFERENCES

- *Mössbauer spectroscopy of conversion electrodes for Na-ion battery*. S. Rubio, G.F. Ortiz, R. Alcántara, P. Lavela, C. Pérez-Vicente, J.L. Tirado. MECAME-GFSM 2019. Montpellier (France), 19-23 may, 2019.
- *Metal substitution vs. metal oxide coating to enhance the performance of NASICON cathodes for Na-ion batteries*. R. Klee, M. Wiatrowski, M.J. Aragón, M.J. Aragón, P. Lavela, G.F. Ortiz, R. Alcántara, J.L. Tirado. Power our future 2017. The 3rd international forum on progress and trend in battery and capacitor technologies. Vitoria-Gasteiz (Spain), 2-5 july, 2017.
- *Tin anode for Mg-ion batteries versus manganese spinel oxides*. M. Cabello, R. Alcántara, F. Nacimiento, G. Ortiz, P. Lavela, C. perez-Vicente, J.L. Tirado. 1st international symposium on magnesium batteries. Ulm/Blautal (Germany), 21-22 july, 2016.
- *On the use of carbon materials derived from side products of the petroleum industry in Na-ion batteries*. R. Klee, M. Cabello, T. Chykra, P. Lavela, R. Alcántara, M.J. Aragón, X. Bai, G.M. Vasylechenko, J.L. Tirado, G.F. Ortiz. International conference on green Chemistry and sustainable engineering. Rome (Italy), 20-22 july, 2016.