

CURRICULUM VITAE ABREVIADO (CVA)

Part A. PERSONAL INFORMATION

First name	Manuel M.		
Family name	Ruiz de Adana Santiago		
Gender	Male	Birth date (dd/mm/yyyy)	-
ID number	-		
e-mail	manuel.ruiz@uco.es	Web	https://es.linkedin.com/in/manuelruizdeadana
ORCID			0000-0002-7890-7505

A.1. Current position

Position	Full Professor		
Initial date	24/7/2021		
Institution	University of Cordoba		
Department/Center	Physical Chemistry Applied Thermodynamics/Polytechnic Eng. School		
Country	Spain	Teleph. number	678740416
Key words	Advanced HVAC systems; Renewable cooling systems; Indoor Air		

A.2. Previous positions (research activity interruptions, indicate total months)

Period	Position/Institution/Country/Interruption cause
1/10/1994 to 30/9/1998	Assistant Professor/University of La Rioja/Spain
1/10/1998 to 1/10/2006	Associate Professor/University of La Rioja/Spain
2/10/2006 to 23/7/2021	Associate Professor/University of Cordoba/Spain

A.3. Education

PhD	University/Country	Year
Doctorate in Industrial Engineering	University of La Rioja	2002

(Include all the necessary rows)

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

Full Professor in the Area of Machines and Thermal Engines of the Department of Physical Chemistry and Applied Thermodynamics of the University of Córdoba. 29 years of experience. Teaching, research and transfer to industrial companies related to Advanced Air Conditioning systems and Indoor Air Quality topics.

Head of the TEP 974 RATE Research in Applied Thermal Engineering Research Group and principal investigator in more than 10 national and European R&D&I projects and more than 30 contracts with industrial companies in the HVACR sector. Author of 39 publications in top-level international scientific journals and author of more than 100 communications at international conferences. Contributions related to Indoor Air Quality, HVAC systems and Indirect Evaporative Cooling systems. Development of advanced HVAC prototypes in collaboration with HVAC industrial manufacturing companies. Direction of 7 doctoral theses and more than 120 master's and degree final projects related to Indoor Air Quality, HVAC systems and Indirect Evaporative Cooling systems. Member of ATECYR, REHVA, ASHRAE. Active participant in the IEA EBC - Annex 85 - Indirect Evaporative Cooling (2020-2025).

- 3 period of 6 years research production recognized by the national committee for the assessment of the research action (CNEAI). Last period of research recognized: 2013-2018. Regulation 5/6/2019 by the national committee for the assessment of the research action (CNEAI).
- 1 period of 6 year of knowledge transfer between universities and industrial companies recognized by the national committee (CNEAI). Last period of research recognized: 2006-2012. Regulation 14/11/2018 by the national committee (CNEAI).



- 7 Doctoral Thesis supervised. 4 ongoing Doctoral Thesis.
- 39 JCR research papers: (28Q1; 9Q2; 2Q3).
- h-index: 17 (<https://publons.com/researcher/1751416/manuel-ruiz-de-adana/metrics/> last accessed 23/1/2024 10:00 GMT).

Part C. RELEVANT MERITS (sorted by typology)

C.1. Publications (see instructions)

1. **JCR article (Q1).** Jesús Castillo-González, Francisco Comino, Francisco J. Navas-Martos, **Manuel Ruiz de Adana. 2023.** Manufacturing and experimental analysis of a dew-point indirect evaporative cooler using fused deposition modelling 3D printing and polymeric materials, Applied Thermal Engineering, 230, 2023. <https://doi.org/10.1016/j.applthermaleng.2023.120683>
2. **JCR article (Q1).** Francisco Comino, Pablo E. Romero, Esther Molero, **Manuel Ruiz de Adana. 2023.** Experimental evaluation of a 3D printed air dehumidification system developed with green desiccant materials, Applied Thermal Engineering, 227, 2023. <https://doi.org/10.1016/j.applthermaleng.2023.120393>
3. **JCR article (Q1).** María Jesús Romero-Lara, Francisco Comino, **Manuel Ruiz de Adana. 2023.** Seasonal energy efficiency ratio of regenerative indirect evaporative coolers. Simplified calculation method, Applied Thermal Engineering, 220, 2023. <https://doi.org/10.1016/j.applthermaleng.2022.119710>
4. **JCR article (Q2).** Romero-Lara, M.J.; Comino, F.; **Ruiz de Adana, M. 2022.** Experimental and numerical study of dew-point indirect evaporative coolers to optimize performance and design. International Journal of Refrigeration, (2022). <https://doi.org/10.1016/j.ijrefrig.2022.06.006>
5. **JCR article (Q1).** Castillo-González, J., Comino, F., Navas-Martos, J., **Ruiz de Adana, M. 2022.** Life cycle assessment of an experimental solar HVAC system and a conventional HVAC system, Energy and Buildings, 256 111697 (2022). <https://doi.org/10.1016/j.enbuild.2021.111697>
6. **JCR article (Q2).** Romero-Lara, M.J.; Comino, F.; **Ruiz de Adana, M. 2021.** Seasonal Analysis Comparison of Three Air-Cooling Systems in Terms of Thermal Comfort, Air Quality and Energy Consumption for School Buildings in Mediterranean Climates. Energies, 14, 4436 (2021). <https://doi.org/10.3390/en14154436>
7. **JCR article (Q1).** F. Comino, F. Taboas, F. Peci, M. **Ruiz de Adana. 2020.** Detailed experimental analysis of the energy performance of a desiccant wheel activated at low temperature, Applied Thermal Engineering, 178 115580 (2020). <https://doi.org/10.1016/j.solener.2020.02.103>
8. **JCR article (Q1).** F. Peci, F. Taboas, F. Comino, **M. Ruiz de Adana. 2020.** Experimental study of a modular Unglazed transpired collector Façade for building refurbishment, Solar Energy 201 247-258 (2020). <https://doi.org/10.1016/j.solener.2020.02.103>
9. **JCR article (Q1).** F. Comino, J. Castillo González, F.J. Navas-Martos, **M. Ruiz de Adana. 2020.** Experimental energy performance assessment of a solar desiccant cooling system in Southern Europe climates, Applied Thermal Engineering 165 (2020) 114579. <https://doi.org/10.1016/j.applthermaleng.2019.114579>
10. **JCR article (Q1).** F.A. Berlanga, L. Liu, P.V. Nielsen, R.L. Jensen, Alexandre Costa, I. Olmedo, **M. Ruiz de Adana. 2020.** Influence of the geometry of the airways on the characterization of exhalation flows. Comparison between two different airway complexity levels performing two different breathing functions, Sustainable Cities and Society 53 (2020) 101874. <https://doi.org/10.1016/j.scs.2019.101874>
11. **JCR article (Q1).** F. Peci-López, F. Táboas, F. Comino, **M. Ruiz de Adana. 2019.** Experimental study of overheating of an unglazed transpired collector façade under southern European summer conditions for four modes of operation, Solar Energy. 189 (2019) 194-206. <https://doi.org/10.1016/j.solener.2019.07.058>



12. **JCR article (Q1)**. Olmedo, I.; Berlanga-Cañete, F. A.; Villafruela, J. M.; **Ruiz de Adana, M.** 2019. Experimental variation of the personal exposure in a hospital room influenced by wall heat gains. *Energy and Buildings*. 2019: 154: 252-262.
<https://doi.org/10.1016/j.buildenv.2019.03.008>
13. **JCR article (Q1)**. Villafruela JM, Olmedo I, Berlanga FA, **Ruiz de Adana M.** 2019. Assessment of displacement ventilation systems in airborne infection risk in hospital rooms. *PLoS ONE* 14(1): e0211390.
<https://doi.org/10.1371/journal.pone.0211390>.
14. **JCR article (Q1)**. F. Comino, D. Guijo-Rubio, M. **Ruiz de Adana**, C. Hervás-Martínez. 2019. Validation of multitask artificial neural networks to model desiccant wheels activated at low temperature. *International Journal of Refrigeration*, 100, 434–442.
<https://doi.org/10.1016/j.ijrefrig.2019.02.002>
15. **JCR article (Q1)**. Francisco Comino, Samanta Milani, Stefano De Antonellis, Cesare Maria Joppolo, **Manuel Ruiz de Adana.** 2018. Simplified performance correlation of an indirect evaporative cooling system: Development and validation. *International Journal of Refrigeration* 88, 2018.
<https://doi.org/10.1016/j.ijrefrig.2018.02.002>
16. **JCR article (Q1)**. F. Comino, **M. Ruiz de Adana**, F. Peci. 2018. Energy saving potential of a hybrid HVAC system with a desiccant wheel activated at low temperatures and an indirect evaporative cooler in handling air in buildings with high latent loads. *Applied Thermal Engineering*, 131, 2018.
<https://doi.org/10.1016/j.applthermaleng.2017.12.00>

C.2. Congress, indicating the modality of their participation (invited conference, oral presentation, poster)

1. **International conference**. María Jesús Romero-Lara, Francisco Comino, **M. Ruiz de Adana.** (2023). Energy Efficiency analysis of two air-cooling systems for dry and humid climates, World Sustainable Energy Days International Conference, Feb 28- March 3, 2023, Wels (Austria). Oral presentation.
2. **International conference**. Francisco Comino, Pablo E. Romero, Esther Molero, **M. Ruiz de Adana.** (2023). Desiccant dehumidification system developed using Additive Manufacturing and biodegradable materials, 10th Manufacturing Engineering Society International Conference (MESIC), Jun 28-30, 2023, Seville (Spain). Oral presentation.
3. **International conference**. Pablo E. Romero, Francisco Comino, Esther Molero, **M. Ruiz de Adana.** (2023). High compactness heat exchanger manufactured using Stereolithography technology and photosensitive resin, 10th Manufacturing Engineering Society International Conference (MESIC), Jun 28-30, 2023, Seville (Spain). Oral presentation.
4. **International conference**. María Jesús Romero-Lara, Francisco Comino, **M. Ruiz de Adana.** (2023). Long-term energy performance of dew-point indirect evaporative cooler under the climate change world scenario, 43rd AIVC-11th TightVent & 9th venticool Conference. October 4-5, 2023. Aalborg University, Copenhagen (Denmark). Oral presentation. Best Paper in the Student Competition Award.
5. **International conference**. Francisco Comino, María Jesús Romero-Lara, **M. Ruiz de Adana.** (2023). Optimization of the design of dew-point indirect evaporative coolers with cooling and ventilation requirements, 13CNIT 13th National and 4th International Conference in Engineering Thermodynamics, Castellón de la Plana (Spain). Oral presentation.
6. **International conference**. María Jesús Romero-Lara, Francisco Comino, **M. Ruiz de Adana.** (2023). Thermal evaluation of two advanced air-cooling systems for different Spanish climate zones, 13CNIT 13th National and 4th International Conference in Engineering Thermodynamics, Castellón de la Plana (Spain). Oral presentation.
7. **International conference**. I. Olmedo, F. Peci, J.L. Sánchez, **M. Ruiz de Adana.** (2022). Experimental Measurements of Particles and CO2 Exhaled by a Manikin in a Hospital Room, ASHRAE IAQ 2020 International Conference May 4-6, 2022, Athens (Greece).
8. **International conference**. F. Comino, J. Castillo-Gonzalez, J. Navas-Martos, Pablo E. Romero, **M. Ruiz de Adana.** (2022). Design of highly compact indirect evaporative coolers, CLIMA2022 14th REHVA World Congress, May 22-25, 2022, Rotterdam (The Netherlands).



- 9. International conference.** M.J. Romero-Lara, F. Comino, **M. Ruiz de Adana. (2022).** Experimental assessment of the thermal effectiveness of a regenerative indirect evaporative cooler, CLIMA2022 14th REHVA World Congress, May 22-25, 2022, Rotterdam (The Netherlands).
- 10. International conference.** M.J. Romero, F. Comino, **M. Ruiz de Adana. (2022).** Environmental and water-use efficiency for indirect evaporative coolers in Southern Europe. Innovations Sustainability Modernity Openness 2022, May 26-27, 2022, Bialystok (Poland).
- 11. International conference.** J. Castillo-Gonzalez, F. Comino, J. Navas-Martos, **M. Ruiz de Adana. (2022).** Ecodesign strategies for reducing environmental impact on solar HVAC systems. Innovations Sustainability Modernity Openness 2022, May 26-27, 2022, Bialystok (Poland).
- 12. International conference.** F. Comino, M.J. Romero, **M. Ruiz de Adana. (2021).** Experimental and numerical analysis of regenerative indirect evaporative coolers. Innovations Sustainability Modernity Openness 2021, May 13, 2021, Bialystok (Poland).

C.3. Research projects, indicating your personal contribution. In the case of young researchers, indicate lines of research for which they have been responsible.

- 1. Research Project.** WEDISTRIC. Smart and local reneWable Energy DISTRICT heating and cooling solutions for sustainable living. H2020-WIDESPREAD2018-03-857801. H2020-LC-SC3-2018-2019-2020 (BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE: SECURE, CLEAN AND EFFICIENT ENERGY) Topic: LC-SC3-RES-8-2019 Type of action: IA Proposal. **PI Ruiz de Adana, Manuel. 2019-2024.** 2.015.656 €.
- 2. Research Project.** DCOOL. Decarbonization of building cooling systems. Development of indirect evaporative cooling systems using additive manufacturing techniques, TED2021-129648B-I00. MICCIN. National R&D 2021-2023. 2021-2023. Strategic projects aimed at ecological and digital transition 2021. **PI Ruiz de Adana, Manuel** and Comino Montilla, Francisco. **2022-2024.** 106.375 €.

C.4. Contracts, technological or transfer merits, Include patents and other industrial or intellectual property activities (contracts, licenses, agreements, etc.) in which you have collaborated. Indicate: a) the order of signature of authors; b) reference; c) title; d) priority countries; e) date; f) Entity and companies that exploit the patent or similar information, if any

- 1. Contract UTAP-CDTI.** Research and development of air treatment and purification equipment. Ref. 12020184, KEYTER TECH. (Spain). **PI Ruiz de Adana, Manuel. 2021-2022.** 92.244,70 €.
- 2. Contract R-UTAP-CDTI.** R-UTAP: Research and development of air purification treatment equipment in refrigeration equipment. Ref. 12021004, KEYTER TECH. (Spain). **PI Ruiz de Adana, Manuel. 2021-2022.** 26,520 €.
- 3. Contract CLIMASEE.** New environmentally sustainable air conditioning system based on evaporative cooling technology. Ref. 12020113, Fundación Andaltec I+D+i. Andalucía. **PI Ruiz de Adana, Manuel. 2020-2021.** 4,392 €.
- 4. Contract SOLPLAS:** Research of secondary equipment coupled to the solar concentrator. Ref. 12017251, Fundación Andaltec I+D+i. Andalucía. **PI Ruiz de Adana, Manuel. 2018-2018.** 4,000€.
- 5. Contract PVCOMFORT-CDTI.** Development of HVAC prototypes for direct coupling of photovoltaic solar energy in efficient equipment for air conditioning and DHW production in the tertiary and domestic sector. CDTI. Ref. OTRI-OTEM 12018096, KEYTER TECH. (Spain). **PI Ruiz de Adana, Manuel. 2018-2020.** 74.700 €.
- 6. National Patent.** Inventors: **Ruiz de Adana, Manuel.** Comino Montilla, Francisco, Navas Martos, Francisco Javier, Castillo González, Jesús. Publication number: **ES2933748.** Title: Ultra-compact, high-efficiency exchanger for the simultaneous treatment of air temperature and humidity. Priority countries: Spain. Expedition date: 07/27/2023. Owners: University of Cordoba and Andaltec RDI Foundation.