ESCUELA POLITÉCNICA SUPERIOR DE SEVILLA

MEMORIA DE INVESTIGACIÓN EPS 2025

ESCUELA POLITÉCNICA SUPERIOR

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ÍNDICE

Toda la información que muestran las gráficas en las páginas siguientes están tomados de SciVal, una herramienta de evaluación del rendimiento de la investigación por suscripción que utiliza datos de SCOPUS y que proporciona medidas bibliométricas más avanzadas que las disponibles en SCOPUS o Web of Science. Permite, por ejemplo, comparar investigadores individuales, grupos de investigadores e instituciones en base a una variedad de métricas diferentes.
Todas, salvo la información para "Publicaciones por cuartiles" cuyos datos han sido tomados de *Journal Citation Report (WOS).*

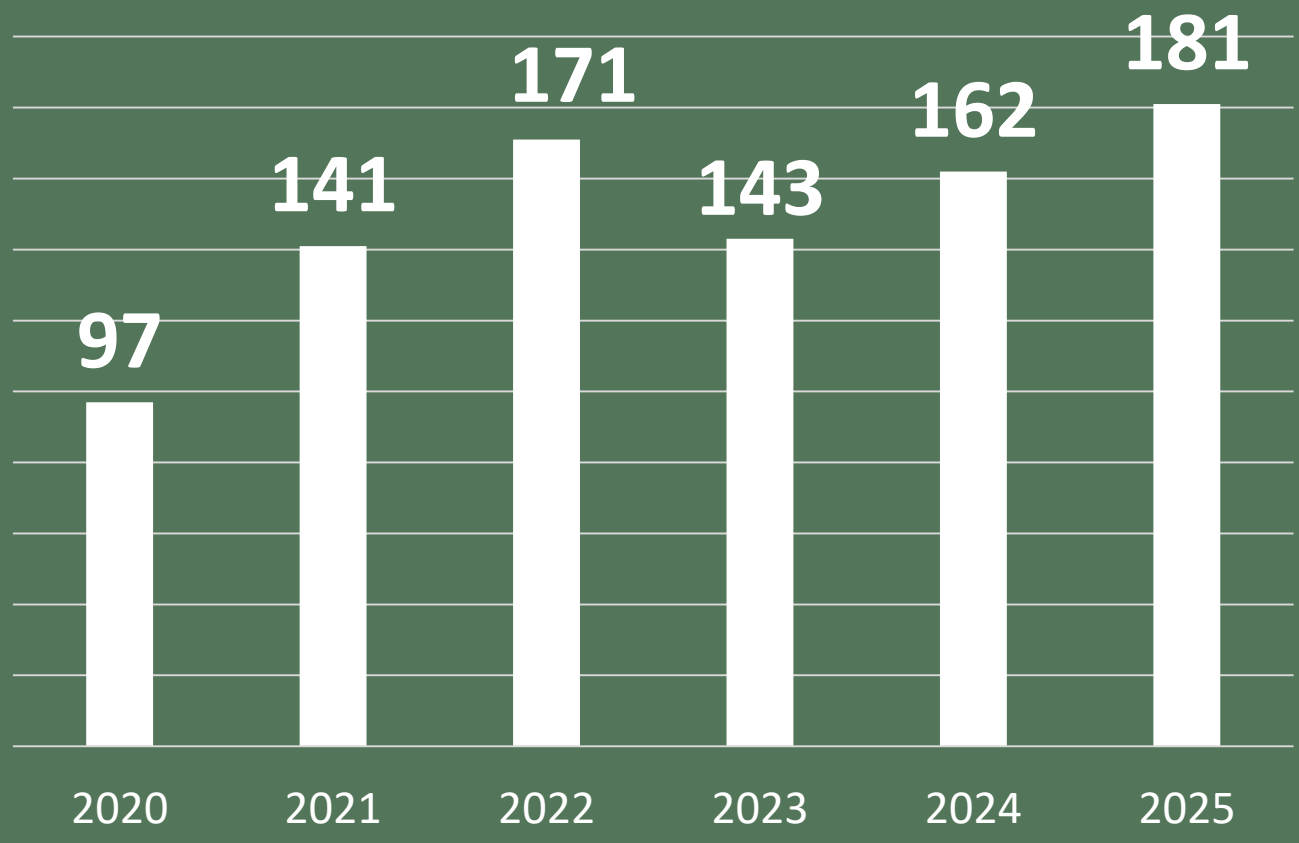
Fecha de extracción de datos de SciVal: 14 enero 2026

Fe de erratas:
1º En el primer semestre se contabilizó un artículo que no pertenecía a ningún investigador de la EPS. Por tanto eran 76 artículos en lugar de 77.
2º Se había contabilizado un artículo en ambos semestres, con lo que la suma total alcanza la cifra de 181 artículos.

1. EN CIFRAS

EN CIFRAS

EVOLUCIÓN DE PUBLICACIONES EPS



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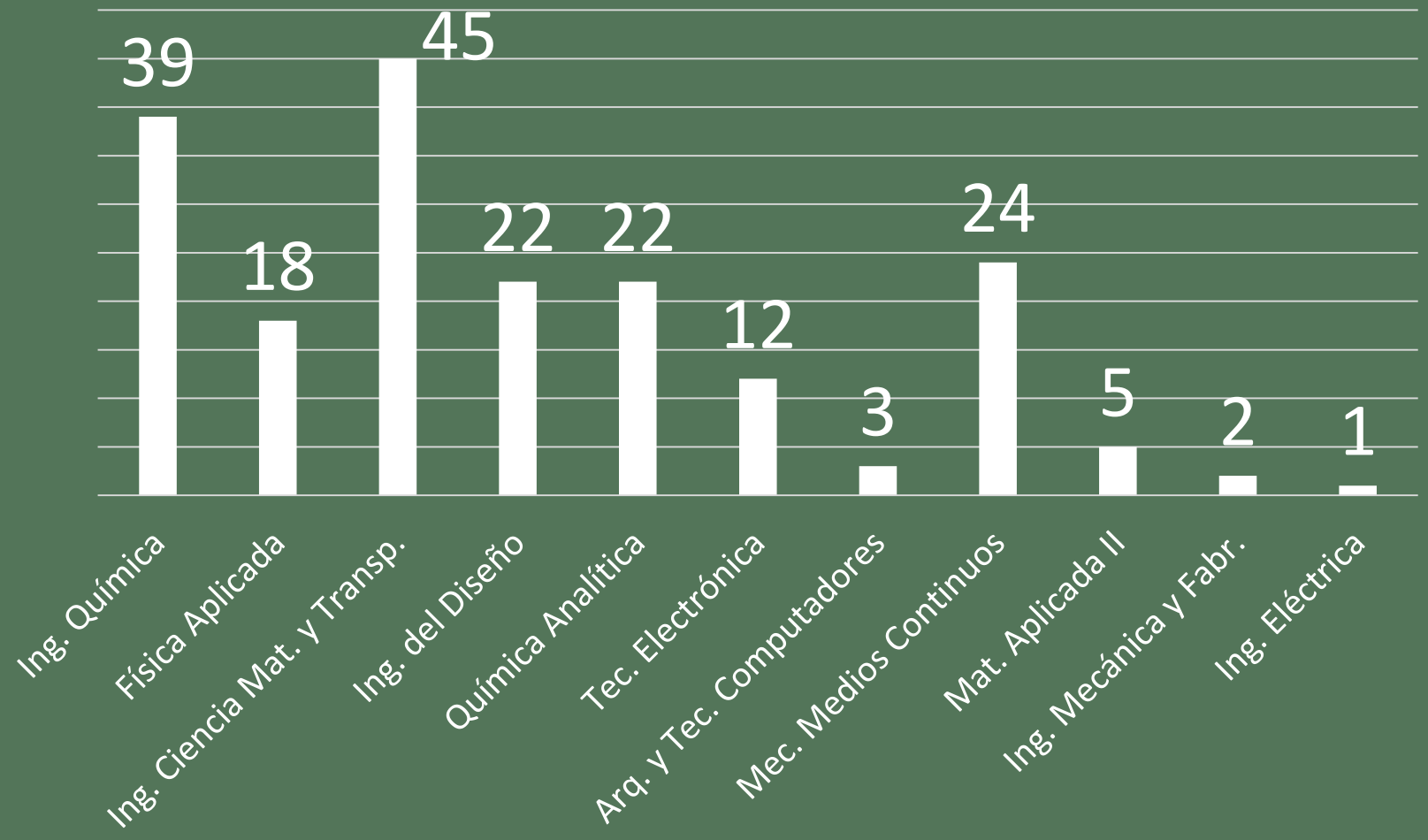
PUBLICACIONES POR DEPARTAMENTOS EPS



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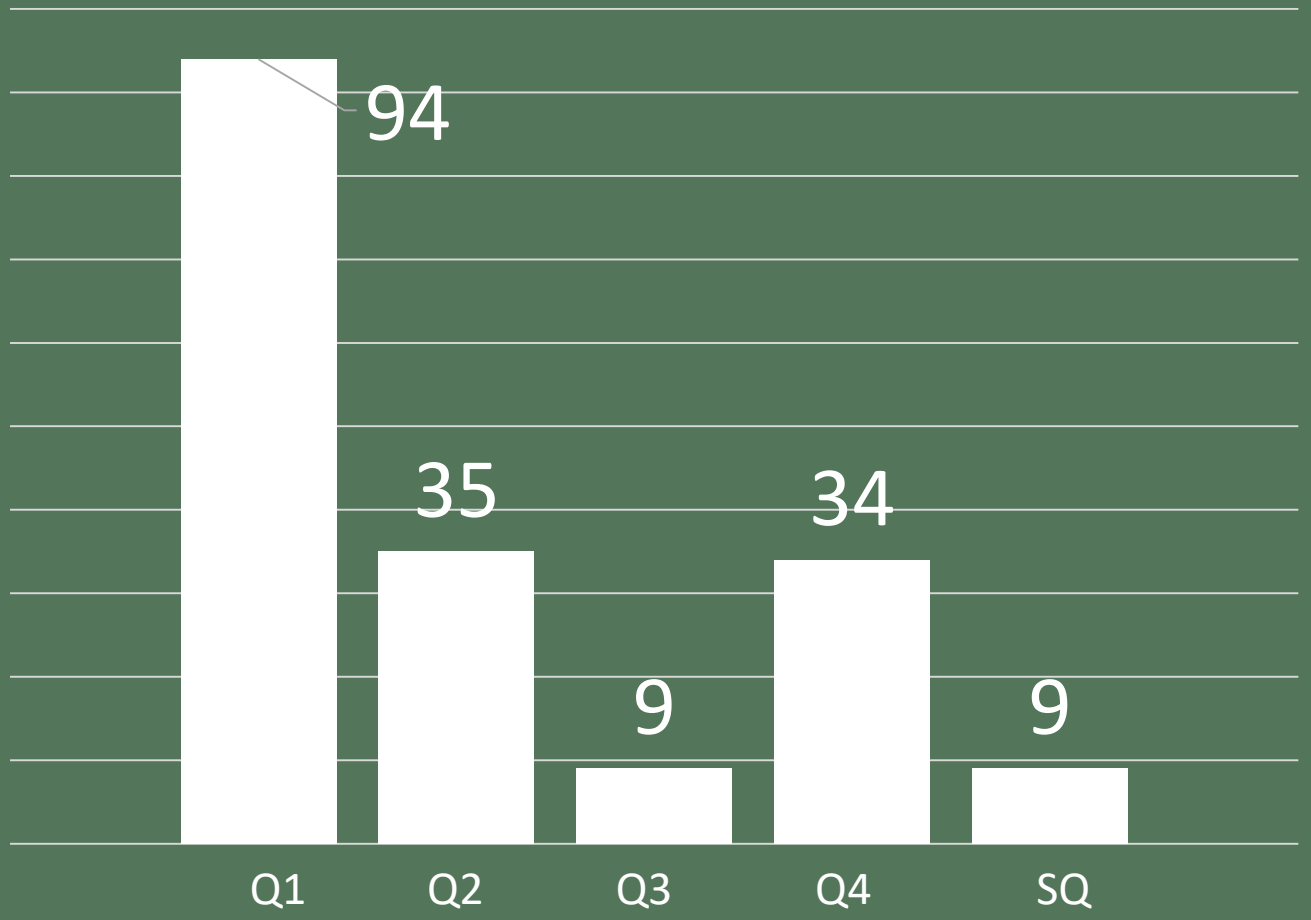
PUBLICACIONES POR CUARTILES (JCR)



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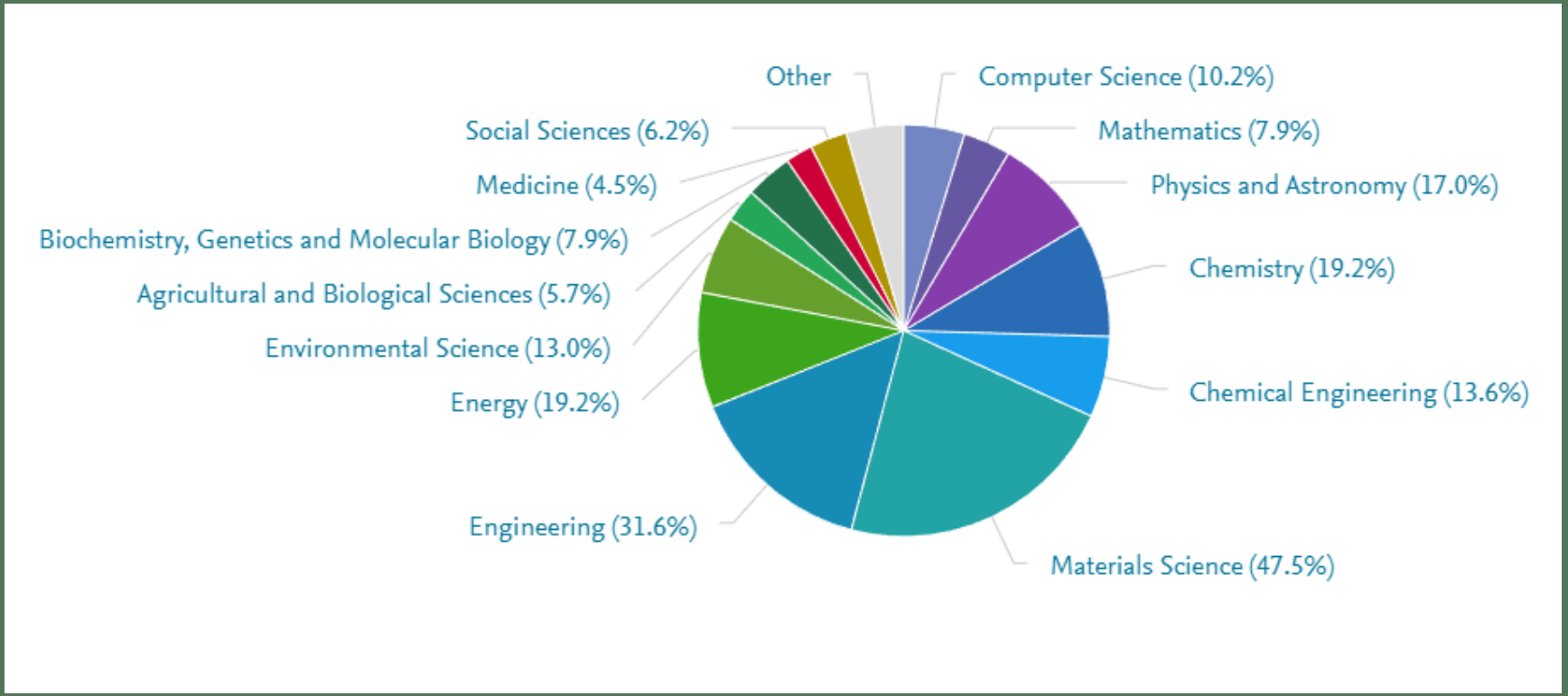
PUBLICACIONES POR ÁREAS TEMÁTICAS



NOTA: El tamaño del segmento representa la participación relativa de publicaciones por área temática. Téngase en cuenta que una publicación se puede asignar a múltiples áreas temáticas.

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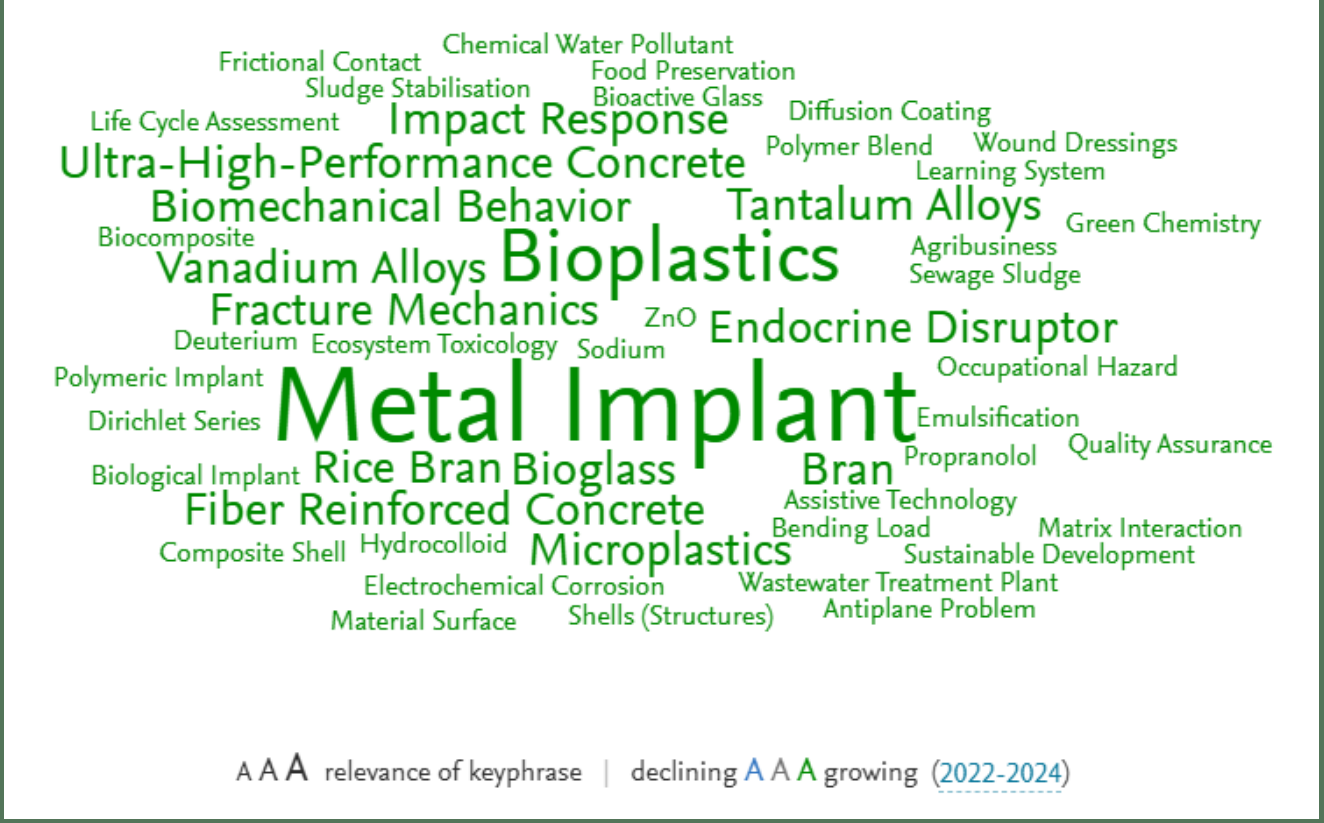
TÉRMINOS CLAVE

(GRÁFICA TOMADA DE SCIVAL (ESCOPUS)



NOTA: 50 términos clave principales por relevancia

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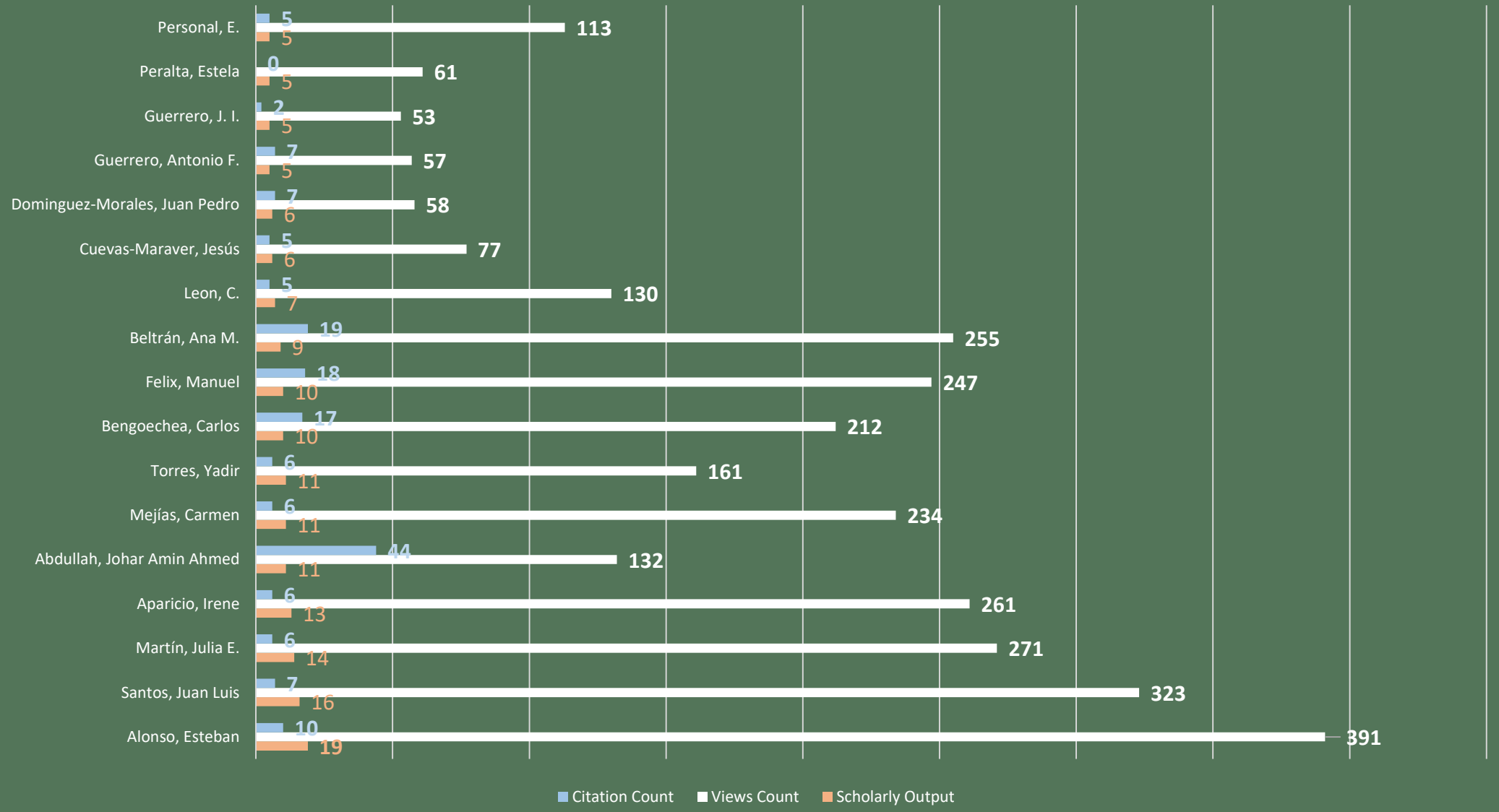
INVESTIGADORES EPS CON 5 O MÁS PUBLICACIONES EN SCOPUS



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PUBLICACIONES CON FWCI MÁS ALTO

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Top 5 publications in My Publication Set - 15 January 2026, by FWCI

Publication	Citations	Field-Weighted Citation Impact
Hydrogels and Nanogels: Pioneering the Future of Advanced Drug Delivery Systems. Delgado-Pujol, E.J., Martínez, G., Casado-Jurado, D., Torres, Y. and 5 more (2025) Pharmaceutics, 17 (2). View in Scopus	68	23.66
Green synthesis of α-Fe2O3 and α-Fe2O3@Ag NC for degradation of rose Bengal and antimicrobial activity. Zouari, Ahmed, R., Laouini, S. E., Salmi, C., Abdullah, J. A. A. and 5 more (2025) Biomass Conversion and Biorefinery, 15 (1), pp. 255-269. View in Scopus	50	18.08
Green synthesis of ZnO@SiO2 nanoparticles using Calligonum comosum L. extract: an efficient approach for organic pollutant degradation in wastewater. Gharbi, A.H., Hemmami, H. Laouini, S.E., Abdullah, J. A. A. and 5 more (2025) Biomass Conversion and Biorefinery, 15 (1), pp. 701-712. View in Scopus	41	14.62
Detailed Assessment of Hardware Implementations, Attacks and Countermeasures for the Ascon Authenticated Cipher. Martín-González, M., Tena-Sánchez, E., Potestad-Ordóñez, F.E. and 1 more (2025) Electronics Letters, 61 (1). View in Scopus	1	11.1
A data-driven topology identification method for low-voltage distribution networks based on the wavelet transform. García, S., Fresia, M., Mora-Merchán, J.M., Carrasco, A., Persona, E., León de Mora, C. (2025) Electric Power Systems Research, 243. View in Scopus	12	7.36

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COLABORACIÓN GEOGRÁFICA

Metric	Publication share	Citations	Citations per Publication
International collaboration	51.4%	258	2.8
Only national collaboration	19.8%	34	1.0
Only institutional collaboration	28.2%	119	2.4
Single authorship (no collaboration)	0.6%	0	0.0

2. PUBLICACIONES EPS

Scopus EXPORT DATE: 14 Jan 2026

1. Agote Garrido, A., Martín Gómez, A.M., Lama Ruiz, J.R. (2025) 08-013 – Resilient ergonomic management in engineering companies: principles, models and practical applications [Gestión ergonómica resiliente en empresas de ingeniería: principios, modelos y aplicaciones prácticas]. *Proceedings from the International Congress on Project Management and Engineering*, pp. 2376-2390.

2. Agote-Garrido, A., Martín-Gómez, A.M., Lama-Ruiz, J.R. (2025) Emerging Paradigms of Sociotechnical Systems for Industry X.0. *Springer Proceedings in Materials*, 85, pp. 467-477. DOI: 10.1007/978-3-031-99987-1_47

3. Aguilar-Planet, T., Picardo, A., Fernández-Rodríguez, J.-F., Martín-Mariscal, A., Peralta, E. (2025) New Perspectives in S-LCA: Development of a Model to Assess Social Impacts in the "Children" Category. *Springer Proceedings in Materials*, 85, pp. 154-160. DOI: 10.1007/978-3-031-99987-1_16

4. Aguilar-Planet, T., Picardo, A., Fernández-Rodríguez, J.-F., Martín-Mariscal, A., Peralta, E. (2025). Biomimicry: Engineering Inspired by Nature. *International Journal of Design Management and Professional Practice*, 19 (1), pp. 155-175. DOI: 10.18848/2325-162X/CGP/v19i01/155-175

5. Aguilar-Romero, I., Madrid, F., Villaverde, J., Alonso, E., Santos, J.L., Morillo, E. (2025) Removal of Ibuprofen in Water by Bioaugmentation with Labrys neptuniae CSW11 Isolated from Sewage Sludge—Assessment of Biodegradation Pathway Based on Metabolite Formation and Genomic Analysis. *Journal of Xenobiotics*, 15 (1), art. no. 5. DOI: 10.3390/jox15010005

6. Ainin, F.N., Azaman, M.D., Ferreira, L.M., Coelho, C.A.C.P., Abdul Majid, M.S., Ridzuan, M.J.M. (2025) Influence of Water Absorption on the Impact Response and Failure Mechanisms of 3D-Printed PLA-Based Honeycomb Sandwich Composite Structures. *Polymer Composites*. DOI: 10.1002/pc.70264

7. Aissa, A., Belghit, M., Barani, D., Benaissa, Y., Laouini, S., Bouafia, A., Lanez, T., Abdullah, M., Al-Lohedan, H., Abdullah, J. (2025) Integrated Evaluation on the Anti-Corrosion Potential of XC52 Alloy Mild Steel in Acidic Conditions Implying Schiff Base and Its Copper Complex. *Applied Organometallic Chemistry*, 39 (7), art. no. e70243. DOI: 10.1002/aoc.70243

8. Alagia, M., Bengoechea, C., La Ferla, B., Peri, F., Guerrero, A. (2025) Effects of the green cross-linking agent tannic acid and its oxidation on the properties of porcine plasma protein superabsorbent materials. *International Journal of Biological Macromolecules*, 304, art. no. 140584. DOI: 10.1016/j.ijbiomac.2025.140584

9. Alarcón, A.C., Gallardo, J.M., Jiménez-Losada, A. (2025) Weighing hierarchical power and active contribution in cooperative games with authorization structure. *OR Spectrum*, 47 (2), pp. 643-666. DOI: 10.1007/s00291-024-00779-7

10. Alba-Rodríguez, M.D., Lucas-Ruiz, V., Marrero, M. (2025) Systematic Methodology for Estimating the Social Dimension of Construction Projects—Assessing Health and Safety Risks Based on Project Budget Analysis. *Buildings*, 15 (13), art. no. 2313. DOI: 10.3390/buildings15132313

11. Alfaro-Rodríguez, M.-C., Vela, F., García-González, M.-C., Muñoz, J. (2025) Flaxseed Fiber-Structured Nanoemulgels for Salad Dressing Applications: Processing and Stability. *Gels*, 11 (9), art. no. 678. DOI: 10.3390/gels11090678

12. Alfaro-Rodríguez, M.-C., Garcia-González, M.-C., Muñoz, J. (2025) Ultrasonic Processing and Its Impact on the Rheology and Physical Stability of Flaxseed Fiber Dispersions. *Applied Sciences (Switzerland),* 15 (14), art. no. 8107. DOI: 10.3390/app15148107

13. Alonso-González, M., Felix, M., Romero, A., Aliotta, L., Gigante, V., Sergi, C., Bavasso, I., Sarasini, F. (2025) Innovative approaches to bioplastic development: rice bran/PLA blends via extrusion combined with injection molding and 3D printing. *Journal of Environmental Management*, 389, art. no. 126081. DOI: 10.1016/j.jenvman.2025.12608

14. Alonso-González, M., Felix, M., Romero, A., Pollet, E. (2025) Combining extrusion and hot compression molding for the development of bioplastics and nano-biocomposites based on rice bran. *Journal of Food Engineering*, 396, art. no. 112559. DOI: 10.1016/j.jfoodeng.2025.112559

15. Alonso-González, M., Felix, M., Romero, A., Sergi, C., Bavasso, I., Sarasini, F. (2025) Optimization of Processing Conditions for Rice Bran-based Bioplastics Through Extrusion and Injection Molding. *Journal of Polymers and the Environment*, 33 (1), pp. 512-527. DOI: 10.1007/s10924-024-03377-4

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18. Alsadat-Seyedbokaei, F., Felix, M., Bengoechea, C. (2025) Zein as a basis of green plastic materials: Modifications, applications, and processing. *International Journal of Biological Macromolecules*, 331, art. no. 148287. DOI: 10.1016/j.ijbiomac.2025.148287

19. Alvarez, M.T., Peralta, E. (2025) Occupational Risk Prevention in People with Autism Spectrum Disorder: A Review of the State of the Art. *Safety,* 11 (4), art. no. 97. DOI: 10.3390/safety11040097

20. Álvarez-Caudevilla, P., Brändle, C., Molina-Becerra, M., Suárez, A. (2025) Interface logistic problems: Large diffusion and singular perturbation results. *Nonlinear Analysis, Theory, Methods and Applications*, 255, art. no. 113777. DOI: 10.1016/j.na.2025.113777

21. Alvarez-Espada, J.-M., Peralta, E. (2025) Assessing Complex Risks. From Bow-Tie Analysis to Bayesian Modelling. *Springer Proceedings in Materials*, 85, pp. 478-488. DOI: 10.1007/978-3-031-99987-1_48

22. Anand, A., Sengupta, S., Galusek, D., Beltrán, A.M., Galusková, D., Boccaccini, A.R. (2025) A new approach to overcome cytotoxic effects of Cu by delivering dual therapeutic ions (Sr, Cu). *Journal of Trace Elements in Medicine and Biology*, 87, art. no. 127565. DOI: 10.1016/j.jtemb.2024.127565

23. Aranda, M.T., Távara, L., Reinoso, J., Camanho, P.P. (2025) Single lap joint (SLJ) fracture assessment of 3D printing composite parts using structured and flat interface definitions: Experimental and numerical study. *Composite Structures*, 355, art. no. 118788. DOI: 10.1016/j.compstruct.2024.118788

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26. Arenas, M., Martín, J., Santos, J.L., Aparicio, I., Alonso, E. (2025) Automatised online SPE-LC-MS/MS method for the enantioselective determination of chiral β-blockers and antidepressants in wastewater. *Analytica Chimica Acta*, 1361, art. no. 344152. DOI: 10.1016/j.aca.2025.344152

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29. Arévalo, C.M., Pérez-Soriano, E.M., Ariza, E., Kitzmantel, M., Montealegre-Meléndez, I. (2025) Optimizing Titanium-Boron Carbide Composites for Aerospace Manufacturing via Plasma Metal Deposition. *Materials Science Forum*, 1146, pp. 49-56. DOI: 10.4028/p-4T23q8

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31. Barani, D., Laouini, S.E., Bouafia, A., Mohammed, H.A., Mahboub, M.S., Abdullah, M.M.S., Laouini, A., Abdullah, J.A.A. (2025) An eco-responsible approach to the synthesis of AgFeO2 nanocomposite via Portulaca oleracea: Towards improved chlorpyrifos photocatalysis and antibacterial properties. *Environmental Progress and Sustainable Energy.* DOI: 10.1002/ep.70151

32. Barquero, M., Trujillo-Cayado, L.A., Santos, J. (2025) Dual-Particle Synergy in Bio-Based Linseed Oil Pickering Emulsions: Optimising ZnO–Silica Networks for Greener Mineral Sunscreens. *Materials*, 18 (13), art. no. 3030. DOI: 10.3390/ma18133030

33. Başak, O., Kurtuldu, F., Ilavský, J., Vitázková, M., Beltrán, A.M., Muñoz, F., Castro, Y., Michálek, M., Chromčíková, M. (2025) Influence of calcium nitrate timing on the structural and textural characteristics of mesoporous SiO2-CaO nanoparticles. *Open Ceramics*, 23, art. no. 100807. DOI: 10.1016/j.oceram.2025.100807

34. Ben Jadi, S., Bahend, K., El Fazdoune, M., Iranzo, A., García-García, F.J., Bazzaoui, M. (2025) Study of the electrodeposition of conductive polypyrrole doped saccharin coatings on 316L stainless steel plate for PEMFC application. *International Journal of Hydrogen Energy*, 138, pp. 1066-1076. DOI: 10.1016/j.ijhydene.2025.05.122

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36. Bider, F., Gunnella, C., Reh, J.T., Clejanu, C.-E., Kuth, S., Beltrán, A.M., Boccaccini, A.R. (2025) Enhancing alginate dialdehyde-gelatin (ADA-GEL) based hydrogels for biofabrication by addition of phytotherapeutics and mesoporous bioactive glass nanoparticles (MBGNs). *Journal of Biomaterials Applications*, 39 (6), pp. 524-556. DOI: 10.1177/08853282241280768

37. Bordón, M.G., López-Vidal, L., Martínez, M.L., Carrera-Sánchez, C., Pizones Ruiz Henestrosa, V., Palma, S.D., Ribotta, P.D. (2025) Corn starch nanoparticles obtained via wet-stirred media milling: Structural characterization and interfacial activity at the O/W interface. *International Journal of Biological Macromolecules*, 316, art. no. 144731. DOI: 10.1016/j.ijbiomac.2025.144731

38. Bortot Coelho, F.E., Sohn, S.I., Candelario, V.M., Hartmann, N.I.B., Hélix-Nielsen, C., Zhang, W. (2025) Microplastics removal from a hospital laundry wastewater combining ceramic membranes and a photocatalytic membrane reactor: Fouling mitigation, water reuse, and cost estimation. *Journal of Membrane Science*, 715, art. no. 123485. DOI: 10.1016/j.memsci.2024.123485

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40. Bustos, L.F., Vasile, F.E., Ruiz-Henestrosa, V.M.P., Carrera-Sánchez, C., Pérez, O.E. (2025) Buffalo whey proteins - Vitamin E macromolecular bioinspirated complexes. Formation and performance at air/water interface. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 718, art. no. 136871. DOI: 10.1016/j.colsurfa.2025.136871

41. Calero, N., Trujillo-Cayado, L.A., Carrillo, F., Oliveira, S., Raymundo, A. (2025) Synergistic rheology of chia and aloe vera mucilage with Spirulina residue: Enhancing emulsion stability for sustainable food applications. *Journal of Molecular Liquids*, 437, art. no. 128306. DOI: 10.1016/j.molliq.2025.128306

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43. Canete, R., Green, K.E., Peralta, M.E. (2025) Empowering Novice Designers to Design and Prototype Tailored Assistive Technologies for Children with Autism. *SeGAH 2025 - 2025 IEEE 13th Conference on Serious Games and Applications for Health*. DOI: 10.1109/SeGAH65397.2025.11168421

44. Cañete, R., Picardo, A., Trueba, P., Peralta, E. (2025) Artificial Intelligence in Assistive Robots for Children with Autism. *Springer Proceedings in Materials*, 85, pp. 287-296. DOI: 10.1007/978-3-031-99987-1_30

45. Cardenete-Fernández, M., Castillo-Rivas, A., Durán-Barrantes, M.M., Trujillo-Cayado, L.A., Santos, J. (2025) Designing Spoonable Milk Kefir Gels: From Fermentation Optimization to Clean-Label Gel Structuring with Psyllium. *Gels*, 11 (9), art. no. 693. DOI: 10.3390/gels11090693

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47. Castilla, M.V. (2025) The European Influence on Qing Dynasty Architecture: Design Principles and Construction Innovations Across Cultures. *Heritage*, 8 (8), art. no. 311. DOI: 10.3390/heritage8080311

48. Castillejo, A., Martínez, G., Delgado-Pujol, E.J., Villalobo, E., Carrillo, F., Casado-Jurado, D., Pérez-Bernal, J.L., Begines, B., Torres, Y., Alcudia, A. (2025) Enhanced porous titanium biofunctionalization based on novel silver nanoparticles and nanohydroxyapatite chitosan coatings. *International Journal of Biological Macromolecules*, 299, art. no. 139846. DOI: 10.1016/j.ijbiomac.2025.139846

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52. Chávez-Vásconez, R., Arévalo, C., Sauceda, S., Leiva, J., Oñate, A., Pérez-Soriano, E.M., Lozano, J.G., Torres, Y., Lascano, S. (2025) Material design of novel TiNbTaHfMo high-entropy alloys for biomedical implants: Exploring an industry-adaptable route via FAST/SPS. *Journal of Materials Research and Technology*, 38, pp. 5094-5115. DOI: 10.1016/j.jmrt.2025.09.004

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3. TENDENCIAS GLOBALES EN INGENIERÍA 2025

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Editorial

2025 Global Engineering Fronts

Comprehensive Group of the Global Engineering Front Research Project

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Engineering science and technology is an important force that can change the world, and engineering fronts represent important directions for future innovation in engineering science and technology. While the new round of scientific and technological revolution and industrial transformation continues to deepen, society is facing unprecedented challenges. All countries now choose to keep abreast of the trends in world science and technology, accurately identify changes, respond to them scientifically, and proactively seek growth and development.

To track development trends in engineering science and technology, the Chinese Academy of Engineering (CAE) has organized a project known as the Global Engineering Fronts every year since 2017 [1,2]. This research identifies and reports on nearly 200 engineering research and engineering development fronts every year to guide academic development and promote innovation in engineering science and technology. The 2025 Global Engineering Fronts research has relied on the nine academic divisions and academic journals of the CAE to identify 94 engineering research fronts and 95 engineering development fronts. This was done by paying equal attention to the engineering research and development fronts, integrating quantitative analyses and qualitative research, and combining data mining with expert argumentation.

In 2025, we continued to improve the technical system at the initial stage of the Global Engineering Fronts project to define the technology boundaries and structures of the nine fields and establish correlations among these branches of technology. In the process of interpreting the key engineering fronts, a development roadmap tool was used to study the development directions of key engineering fronts in the next 5–10 years.

Identifying engineering fronts is a complex and challenging task. For nine years, the research team has been focusing on development hotspots and challenges in global engineering science and technology and has gradually explored a unique research path in which research, forums, and journals are closely integrated to promote each other. This project has been supported by nearly a thousand academicians and experts from various fields and institutions, and we are deeply grateful to all of them.

Tables 1–9 list the Global Engineering Fronts for 2025.

Table 1
Fronts of mechanical and vehicle engineering.

Engineering research fronts	Engineering development fronts
• Electromagnetic wave-absorbing materials and multiscale structural design	• High-energy–density all-solid-state power batteries
• Design methods for mechanical metamaterials	• Low-altitude unmanned aerial vehicle (UAV) swarm countermeasure technology
• Catalyst and diaphragm study of direct seawater electrolysis for hydrogen production	• Task allocation methods for the cooperative strike of multiple UAVs
• Biohybrid robots	• Mission-planning approach for manned and unmanned system collaboration
• Supercritical compressed-air energy storage technology	• Low-altitude traffic management technology based on the artificial intelligence of things
• Coordinated autonomous driving of connected multi-vehicles	• Control of vehicle–road–cloud integrated transportation systems
• Soft robots based on liquid crystal elastomers	• Three-dimensional stacked packaging technology for memory chips
• Vision-based tactile sensors	• Collaborative underwater terrain-mapping technology using unmanned surface vehicles and underwater robots
• Near-space solar-powered airships	• Microchannel cooling technology for 3D integrated packaging
• Underwater multisource localization methods	• Large-model-based fault diagnosis technology

UAV: unmanned aerial vehicle; 3D: three-dimensional.

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Fronts of mechanical and vehicle engineering

Engineering research fronts	Engineering development fronts
• Electromagnetic wave-absorbing materials and multiscale structural design	• High-energy–density all-solid-state power batteries
• Design methods for mechanical metamaterials	• Low-altitude unmanned aerial vehicle (UAV) swarm countermeasure technology
• Catalyst and diaphragm study of direct seawater electrolysis for hydrogen production	• Task allocation methods for the cooperative strike of multiple UAVs
• Biohybrid robots	• Mission-planning approach for manned and unmanned system collaboration
• Supercritical compressed-air energy storage technology	• Low-altitude traffic management technology based on the artificial intelligence of things
• Coordinated autonomous driving of connected multi-vehicles	• Control of vehicle–road–cloud integrated transportation systems
• Soft robots based on liquid crystal elastomers	• Three-dimensional stacked packaging technology for memory chips
• Vision-based tactile sensors	• Collaborative underwater terrain-mapping technology using unmanned surface vehicles and underwater robots
• Near-space solar-powered airships	• Microchannel cooling technology for 3D integrated packaging
• Underwater multisource localization methods	• Large-model-based fault diagnosis technology

UAV: unmanned aerial vehicle; 3D: three-dimensional.

Fronts of information and electronic engineering

Engineering research fronts	Engineering development fronts
• High-speed, low-power on-chip optical interconnect technologies	• Development of AI-powered scientific research automation systems
• Intelligent control theories and methods for cross-domain heterogeneous unmanned systems	• Extreme ultraviolet lithography component inspection technologies
• Theories and technologies of integrated communication, sensing, computing, intelligence, and control network systems	• Co-optimization of design and manufacturing process for sub-5 nm node chips systems
• Multi-agent system construction and collaboration technologies	• Intelligent sensing and control technologies for dexterous robotic hands
• Fundamental theories of bio-syncretic robots	• Digital twin and precision control technologies for high-end equipment manufacturing
• Long-range cross-medium optoelectronic detection and communication technologies	• Open-source implementation of large model inference and optimized deployment technologies
• Mechanisms and methods for macroscopic-scale manufacturing with atomic-level precision	• Real-time detection methods for large sized, complex industrial components
• Computing architecture integrating quantum and classical computing	• Agent-driven electronic design automation technologies
• Double-sided wafer devices and interconnect technologies	• End-to-end low-latency high-throughput intelligent computing network technologies
• Millimeter-wave and terahertz radio frequency front-end integrated circuits	• Optical surveying equipment for submarine topography

AI: artificial intelligence.

Fronts of chemical, metallurgical, and materials engineering

Engineering research fronts	Engineering development fronts
• *In situ* resources utilization on the lunar surface	• Design and scalable preparation of catalyst systems for green electricity–green hydrogen coupled with coal chemical processes
• Flexible structural materials with super elastic multi-sensing function for humanoid robots	• Green recycling of new energy power batteries
• Photoelectrochemical synthesis of high-value-added chemicals	• Multimodal bioconversion of industrial CO_2-rich waste gases to value-added products
• Wide-temperature range zero-expansion spacecraft materials	• Key materials and fabrication technologies for high-efficiency and stable ion batteries
• Study on mass transfer and solidification in confined spaces for new materials	• Accelerated evaluation methods and life prediction for the long-life and safe service of key engineering structural materials
• Metallurgical technology in space microgravity environment	• Development and application of thermal radiation protective ceramic coatings for high-temperature complex service environments
• Bionic electronic skin and intelligent tactile perception systems	• Discovery and rational design of novel polymer materials enabled by machine learning
• Bionic organelles and ordered catalytic systems for high-intensity chemicals, materials, and energy biomanufacturing	• Sustainable recovery of lithium from low-quality sources
• Collaborative reconstruction and closed-loop high-value utilization of multi-source solid waste	• Multiscale architectural design and process integration of high-performance fiber-reinforced composites
• Nano-energy storage materials and devices	• Intensification technology for metallurgical processes under extreme conditions
• Machine learning potential-driven intelligent molecular design and synthesis	• Technologies for methane emission reduction and high-value chemical transformation

Fronts of energy and mining engineering

Engineering research fronts	Engineering development fronts
• Research on AI-based design of energy materials	• AI-driven virtual power plants
• Application of high-temperature superconducting on fusion	• Nuclear power plant safety technology and strategy under extreme climate conditions
• Ore-forming prediction technology based on big data	• Fracturing optimization and productivity prediction technology for complex oil and gas reservoirs
• Research on intelligent development and enhanced recovery methods for unconventional oil and gas resources	• Green intelligent integrated drilling technologies and equipment for ultra-deep oil and gas resources
• Research on key materials for low-cost, safe aqueous batteries	• Offshore wind–solar coupled power generation systems
• Research on large-scale solid-state sequestration of deep-sea CO_2 hydrates	• Multi-energy integration engineering technology for deserts–Gobi–wasteland energy bases with wind–solar–thermal-storage hybrid systems
• Research on behavior of supercritical CO_2 power cycles in fourth-generation nuclear reactors	• Digital twin technology for nuclear power plants
• Intelligent fault diagnosis method in nuclear power plants	• Methods and equipment to boost nuclear power plant output
• Supercritical CO_2 fracturing technology for improving shale reservoir permeability	• Comprehensive evaluation techniques for strategic mineral resources
• Mechanisms of carbon dioxide fracturing crack propagation and carbon sequestration technology	• Integrated intelligent subsurface imaging and reservoir modeling technologies
• Multi-source data-driven intelligent drilling methods and digital wellbore model research	• Enhanced coal mine methane production and CO_2 sequestration in goaf areas
• Multiphase flow behaviors of coalbed methane and its mechanisms for production enhancement	• Thermal hazard control technology for deep mines

Fronts of engineering management

Engineering research fronts	Engineering development fronts
• Intelligent air–ground collaborative low-altitude traffic and logistics	• Methods and technologies of large-mode empowered urban digital governance
• Distributed optimization of low-carbon computing power service systems	• Automatic generation of engineering construction schemes based on LLMs
• Supply chain restructuring under geopolitical risk	• Overview of human–machine–environment integrated industrial digital twin systems
• Extraterrestrial construction system engineering management	• Large language model-based systems for engineering risk identification and quantification
• Human–machine collaborative intelligent manufacturing based on multi-modal large models	• Multi-agent-based quality diagnosis platforms for production lines
• Research on safety assessment and management of intelligent driving systems	• Research and development of AI-enabled learning platforms
• Big data ecosystems and open-sharing mechanisms	• Urban micromobility system integration and optimization
• Interpreting research on affective perception and cognitive regulation in foundation models	• Large model lightweighting for efficient edge inference
• Ecological governance of platform-based corporate social responsibility	• Industrial scheduling system based on large language models
• Research on network governance mechanisms in the era of intelligent agents	• Intelligent regulation technology for cross-basin connectivity projects in the national water network
• Research on urban stock space renewal management and decision-making	• Key BIM technologies and platforms for large-scale linear engineering

LLM: large language model; BIM: building information modeling.

Institutes of Science and Development, Chinese Academy of Sciences, Clarivate (2026). 2025 Research Front: Active Fields, Leading Countries/Regions.

Table 1. The Research Leadership Index (RLI_{Ci}) of Top 20 Countries/regions in 11 broad research areas comprising 128 Research Fronts

	RLI_{Ci}		$RFOI_{Ci}$		$RFII_{Ci}$	
	Score	Rank	Score	Rank	Score	Rank
USA	193.03	1	96.02	2	97.02	1
China	182.37	2	104.05	1	78.32	2
UK	73.93	3	34.68	4	39.26	3
Germany	72.43	4	34.97	3	37.45	4
Canada	41.81	5	18.57	6	23.24	5
Australia	40.55	6	18.43	7	22.12	6
France	39.04	7	18.57	5	20.47	7
Italy	38.06	8	18.08	8	19.98	8
Japan	32.88	9	16.40	9	16.48	9
Spain	32.17	10	15.74	10	16.42	10
Netherlands	26.81	11	12.03	13	14.78	11
Switzerland	26.50	12	12.66	11	13.84	12
South Korea	24.80	13	12.59	12	12.22	13
Sweden	23.09	14	11.11	14	11.98	14
India	21.14	15	11.00	15	10.14	15
Belgium	15.02	16	6.41	17	8.61	16
Austria	13.94	17	7.18	16	6.76	20
Israel	12.89	18	5.75	18	7.14	17
Denmark	12.41	19	5.55	19	6.86	18
Singapore	12.24	20	5.53	20	6.70	21

Institutes of Science and Development of Chinese Academy of Sciences and the National Science Library of Chinese Academy of Sciences and Clarivate (2026) [2025 Research Fronts]

Extraemos de este documento, de interés para nuestro Centro, las siguientes tablas, “hot research fronts”, de:

1.1 TREND OF THE TOP 10 RESEARCH FRONTS IN CHEMISTRY AND MATERIALS SCIENCE (Pag. 69)

1.1 TREND OF THE TOP 10 RESEARCH FRONTS IN PHYSICS (Pag.79)

1.1 TREND OF THE TOP 10 RESEARCH FRONTS IN MATHEMATICS (Pag. 101)

1.1 TREND OF THE TOP 10 RESEARCH FRONTS IN INFORMATION SCIENCE (Pag. 111)

Table 31: Top10 Research Fronts in chemistry and materials science

Rank	Hot Research Fronts	Core papers	Citations	Mean Year of Core Papers
1	Synthesis of bioisosteres of the phenyl ring	40	2738	2023.1
2	High-performance thermoelectric materials	21	2889	2022.9
3	Covalent organic frameworks for photocatalytic hydrogen peroxide production	34	5149	2022.5
4	Recycling spent lithium-ion battery cathode materials	33	8121	2021.8
5	**Chemical recycling and upcycling of waste polyolefin plastics**	**42**	**8845**	**2021.5**
6	Single-crystalline Ni-rich cathodes for Li-ion batteries	19	4442	2021.4
7	Polymers dielectric for high-temperature capacitive energy storage	35	6667	2021.3
8	**Halide solid electrolytes for all-solid-state batteries**	**26**	**5089**	**2021.3**
9	CO_2 electroreduction to multicarbon products	14	3549	2021.3
10	Directed evolution and design of PET hydrolases	24	4862	2021.2

Table 37: Top10 Research Fronts in physics

Rank	Hot Research Fronts	Core Papers	Citations	Mean Year of Core Papers
1	Non-invertible symmetries	48	2815	2022.9
2	**Superconducting diode effect**	**22**	**2076**	**2022.5**
3	High-temperature superconductivity in hydrogen-rich compounds under high pressure	35	5508	2022.0
4	Ga_2O_3 power devices	17	2006	2021.8
5	Ferroelectricity in HfO_2 thin films	12	1979	2021.8
6	New nonlinear optical materials	50	6650	2021.7
7	Ferroelectricity in 2D van der Waals materials	13	2308	2021.7
8	Quantum simulation of lattice gauge theories	18	1980	2021.7
9	**Petawatt class lasers and their applications**	**10**	**2078**	**2021.4**
10	Twin-field quantum key distribution	32	5393	2021.3

Table 48: Top10 Research Fronts in mathematics

Rank	Hot Research Fronts	Core Papers	Citations	Mean Year of Core Papers
1	Neural operator theory, methods, and applications in scientific computing	4	1309	2021.5
2	Iterative optimization for computational imaging based on deep denoising priors	4	686	2021.3
3	Physics-constrained deep learning for scientific computing	12	3159	2020.9
4	**Double descent curve and generalization phenomena in modern machine learning**	**8**	**1084**	**2020.5**
5	Robust statistical inference in high-dimensional statistics	2	166	2020.5
6	**Methods and applications of physics-informed neural networks in solving partial differential equations**	**4**	**9263**	**2020.3**
7	Optimal approximation theory for deep ReLU neural networks and applications to nonparametric regression	15	1346	2020.3
8	Theory and computation of nonlocal models and fractional differential equations	2	368	2020.0
9	Derivative-free and zeroth-order optimization	2	224	2020.0
10	Scalable and exact algorithms for high-dimensional sparse regression and best subset selection	2	196	2020.0

Table 53 Top 10 Research Fronts in information science

Rank	Hot Research Fronts	Core papers	Citations	Mean Year of Core Papers
1	Research on multimodal 3D real-time object detection for intelligent driving scenarios	30	3157	2022.3
2	Research on deep learning-based 6G semantic communication systems	26	2343	2022.3
3	Design and performance optimization of integrated sensing and communications systems	32	4814	2022.0
4	Research on multimodal medical image segmentation and feature extraction	18	4995	2021.9
5	Zero-knowledge proofs: privacy, scalability, and cryptographic applications	24	1086	2021.8
6	Voice-driven 3D facial animation and synchronization technology	19	2226	2021.7
7	**6D object pose estimation and tracking technology**	**23**	**1757**	**2021.7**
8	Language model-based protein structure prediction	31	7424	2021.5
9	**Generation and detection of neural rendering and deepfakes**	**20**	**3764**	**2021.3**
10	Optimizing molecular representation learning via graph neural networks and related techniques	6	1873	2021.2

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