

Dr. ANA INÉS TORRES RIPPA

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Carnegie Mellon University
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EDUCATION

Postdoctoral Training, Chemical Engineering <i>Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts, U.S.A.</i> Advised by George Stephanopoulos	2014
Ph.D., Chemical Engineering <i>University of Minnesota- Twin Cities, Minneapolis, Minnesota, U.S.A.</i> Advised by Prodromos Daoutidis and Michael Tsapatsis	2013
Chemical Engineer <i>Universidad de la República Oriental del Uruguay, Montevideo, Uruguay</i>	2005
BSc. Chemistry <i>Universidad de la República Oriental del Uruguay, Montevideo, Uruguay</i>	2003

PROFESSIONAL APPOINTMENTS

Associate Professor <i>Department of Chemical Engineering</i> <i>Carnegie Mellon University, Pittsburgh, PA, USA</i>	7/2025- Present
Assistant Professor <i>Department of Chemical Engineering</i> <i>Carnegie Mellon University, Pittsburgh, PA, USA</i>	2022- 7/2025
Profesor Agregado G^o4-DT (Effective) <i>Department of Chemical Engineering</i> <i>Universidad de la República, Montevideo, Uruguay</i>	2021- 2022
Profesor Adjunto G^o3-DT (Effective) <i>Department of Chemical Engineering</i> <i>Universidad de la República, Montevideo, Uruguay</i>	2017- 2021
Profesor Adjunto G^o3 <i>Department of Chemical Engineering</i> <i>Universidad de la República, Montevideo, Uruguay</i>	2015- 2016
External Consultant <i>Department of Chemical Engineering</i> <i>Massachusetts Institute of Technology</i>	2015-2016
Postdoctoral Research Associate <i>Department of Chemical Engineering</i> <i>Massachusetts Institute of Technology, Cambridge, Massachusetts, U.S.A.</i>	2013-2014

Graduate Research Assistant <i>Department of Chemical Engineering and Materials Science</i> <i>University of Minnesota, Minneapolis, Minnesota</i>	2007 - 2013
Research and Development Engineer <i>Fanacif S.A. (Affinia Group Inc.), Montevideo, Uruguay</i>	2005 - 2006
Student Intern <i>American Chemical i.c.s.a, Montevideo, Uruguay</i>	2004
Research Assistant <i>School of Chemistry, Department of Food Science and Technology</i> <i>Universidad de la República Oriental del Uruguay, Montevideo, Uruguay</i>	2003 - 2005
Teaching Assistant <i>School of Chemistry, Department of Physical Chemistry</i> <i>Universidad de la República Oriental del Uruguay, Montevideo, Uruguay</i>	2001 - 2003

HONORS/AWARDS/RECOGNITIONS

- Honor: Dean's Early Career Faculty Fellow 2025-2028
Carnegie Mellon University, College of Engineering
- Award: Claire and John Bertucci Fellowship in Engineering 2025-2026
For PhD student Daniel Pert
- Award 2026 TechConnect World Best Student Abstract Award - Honorable Mention 2026
For submission: Design and Optimization of Processing Pathways for Rare Earth Element Recovery from End-of-Life Products
- Award: NSF CAREER Award 2024-2029
"Modeling, optimization, and equilibrium formulations for the analysis and design of circular economy networks"
- Award: Steinbrenner Institute Doctoral Fellowship 2023-2024
For PhD student Abdulhakeem Ahmed. Project: "Design and optimization of circular economy networks: Recycling of polyethylene terephthalate as a case study"
- Recognition: Industrial & Engineering Chemistry Research Journal, Excellence in Review Awards 2023
- Recognition: Invited contribution "Women in Chemical Engineering" special edition of Chemical Engineering Research & Design, recognizing the work of 18 women researchers in several areas of Chemical Engineering.
- Recognition: Invited contribution "Futures Issue: Process Systems Engineering" special edition of the American Institute of Chemical Engineers Journal, recognizing the scholarly potential of emerging scholars.
- Award and Keynote Speaker: Celebration of the 10th Anniversary of the ANII- FSE grant 2019
Selection of Project FSE_1_2015_1_109976 as 1 of 6 best projects of the past ten years
Comité de Agenda Fondo Sectorial de Energía, Administración Nacional de Investigación e

Innovación, Uruguay,

“Biorefinerías en Uruguay: Evaluación tecno-económica de la producción de combustibles y químicos a partir de materia prima y residuos nacionales”

- Keynote Speaker: *XXIX Interamerican Congress of Chemical Engineering Incorporating the 68th Canadian Chemical Engineering Conference*, Toronto, Canada. 2018
“Towards a biomass based chemical industry: recent approaches for product selection and process design”
- Honor: Promoted to Researcher Level I-Sistema Nacional de Investigadores 2018
Administración Nacional de Investigación e Innovación, Uruguay
- Keynote Speaker: *Computer Aided Process Engineering Forum*, Athens, Greece 2017
“Design and analysis of bio-refineries as multi-actor networks”
- Honor: Admission as a Researcher: Sistema Nacional de Investigadores-Nivel Candidato 2015
Administración Nacional de Investigación e Innovación, Uruguay
- Award: Doctoral Dissertation Fellowship 2011 - 2012
Award given by the Graduate School to outstanding Ph.D candidates
University of Minnesota, Minneapolis, Minnesota.
- Award: Student Poster Award 2013
Gordon Research Conference (Nanoporous Materials & Their Applications).

INVITED TALKS

20. PSE+ Monthly Stakeholder Meeting, USA 2026
“Superstructure Optimization of Rare Earth Element Processing Pathways”
19. Sargent Center Seminar, Imperial College, London, UK 2026
“Modeling and optimization formulations for the analysis and design of circular economy networks”
18. Department of Chemical Engineering and Materials Science, University of Minnesota 2026
“Modeling and optimization formulations for the analysis and design of circular economy networks”
17. 2025 Digitalization and AI in Energy Appalachia Conference 2025
“Digitalization and AI in energy: tools for plant simulation and decision making in the chemical Industry”
16. Department of Chemical Engineering, Instituto Tecnológico de Celaya, Mexico 2025
“Process Systems Engineering for Decarbonization of the Chemical Industry”
15. Department of Chemical Engineering, University of Delaware 2025
“Modeling and optimization formulations for the analysis and design of circular economy networks”
14. Department of Chemical Engineering, Kansas State University 2025
“Process Systems Engineering for Decarbonization of the Chemical Industry”

13. BiTR: Biomass Integration with Traditional Refineries - virtual mini-symposium, Georgia Tech, 2025
“Process Systems Engineering approaches for repurposing conventional oil refineries into biomass processing facilities”
12. Department of Chemical Engineering, Mc Master University (Canada) 2025
“Process Systems Engineering for Decarbonization of the Chemical Industry”
11. International Congress on Sustainability Science & Engineering (ICOSSE 25- New Zealand) 2025
“Process Systems Engineering for Decarbonization of the Chemical Industry”
10. Department of Chemical & Biological Engineering, University of Wisconsin 2024
“Process Systems Engineering for Decarbonization of the Chemical Industry”
9. CMU’s Energy Week Power Talk 2024
“Chemical Process Systems Engineering for Electrification/Decarbonization”
8. Department of Engineering and Public Policy, Carnegie Mellon University 2023
“ Storage and Conversion of intermittent renewable energy: Uruguay as a case study ”
7. Departamento de Ingeniería Química, Universidad de Guanajuato 2023
“Almacenamiento y Conversión de Energía Renovable: Hacia economías cero carbono neto ”
6. Department of Chemical Engineering- University of Kansas 2022
“Process Systems Engineering for transitioning to low carbon economies”.
5. 4th Computer Engineering Forum, College of Engineering University of Wisconsin-Madison, 2022
“Perspectives on Net Zero Carbon Processes”.
4. Academia Nacional de Ingeniería del Uruguay: Hidrógeno en Uruguay 2022
“Aportes desde la academia”.
3. Webinar Innovación Química para conseguir los ODS: Construyendo puentes con Iberoamérica (Foro Química y Sociedad, España) 2021
“Aportes desde la Ingeniería de Sistemas de Procesos a los ODS 7, 9 y 13 (energía desarrollo y clima). ”
2. Chemical Engineering Department Seminar, Carnegie Mellon University 2021
“Process systems engineering for transitioning to low carbon economies”.
1. Virtual Workshop Helmántica 2020, Universidad de Salamanca 2020
“Research activities Torres’ group”.

PUBLICATIONS

• Technical Reports

TR1 **Torres, A. I.**, Gutiérrez, S., Kreimerman, Pittaluga, L., Auriello, J., Arsuaga, J., Estefan, N., González, V., Porley, A., “Diseño y evaluación de alternativas tecnológicas para el desarrollo de bio-refinerías”, Final Report, Project ANII-FSE_1_2018_1_152900, 2022.

- TR2 **Torres, A. I.**, Gutiérrez, S., Kreimerman, R., Estefan, N., Helal, A., Mangone, F., Philippi, C., Tejera, M., Ures, P., “Biorefinerías en Uruguay: Evaluación tecno-económica de la producción de combustibles y químicos a partir de materia prima y residuos nacionales”, Final Report, Project ANII-FSE_1_2015_1_109976, 2019.

• **Editorial Contributions**

- E1 **Torres, A.I.**, “Guaranteeing rare earth minerals for a high tech future: an opportunity for cleaner technologies”. *Clean Technologies and Environmental Policy* 27, 971-972 (2025). <https://doi.org/10.1007/s10098-025-03158-0>
- E2 **Torres, A. I.**, “Circular Economy- Not just another name for waste treatment”, *Clean Technologies and Environmental Policy*, March 2024. <https://doi.org/10.1007/s10098-024-02798-y>

• **Book Chapters**

- BC1 González, V., Pedezert, A., Gutiérrez, S., Kreimerman, R., Pittaluga, L., **Torres, A.I.**, Repurposing a conventional oil refinery for biomass processing to aviation fuel: process design and techno-environmental evaluation for a real operating plant. Accepted (2026).
- BC2 Corengia, M., **Torres, A. I.**, “Energy Storage”. *Sustainable design for renewable processes: Principles and case studies*. Ed. Mariano Martín Martín. Elsevier. 2022.
- BC3 Ashraf, M. T., **Torres, A. I.**, Schmidt, J. E., Stephanopoulos, G., “Analysis and optimization of multi-actor biorefineries”, *Biorefinery-Integrated Sustainable Processes*. Eds. Jens Ejbye Schmidt, Juan Rodrigo Bastidas Oyanedel. Written by invitation. Pags. 49-75, Springer-Cham, 2019.
- BC4 **Torres, A. I.**, Ashraf, M. T., Chaturvedi, T., Schmidt, J. E., Stephanopoulos, G., “Hydrothermal Pretreatment: Process Modeling and Economic Assessment within the Framework of Biorefinery Processes”, *Hydrothermal Processing in Biorefineries*. Eds. H. A. Ruiz, H. L. Trajano, M. H. Thomsen. Written by invitation. Pags. 207-235, Springer-Cham, 2017.

• **Journal papers (all peer-reviewed)**

- J1 Maligon Querimit, R., Park, J., Kiggundu Namiro, S., Torres and **Torres, A.I.**, A Comprehensive Techno-Economic-Environmental Assessment for the Recovery of Ce, La, Pr, Nd, and Y from U.S Based Ore Concentrates. Submitted 2026.
- J2 González, V., Ferreira, J., Pedemonte, M., **Torres, A.I.**, Corengia, M., Enabling CO₂ to chemicals processes design: from rigorous to surrogate model of an electrochemical reactor. *Catalysis Today*, 2026. Accepted.
- J3 Chattopadhyay, S., Gandhi, R., Grossmann, I.E. and **Torres, A.I.**, A novel algorithm for bounding the optimal solutions in multi-time scale decarbonization planning problems involving varying energy prices: Electrification of oil refineries as a case study. *Comput. Chem. Eng.*, In Press, 2026.
- J4 Charalambous, M., Vázquez, D., **Torres, A. I.**, Guillén-Gosálbez, G., The underrepresented role of prospective global supply chains in the life cycle optimization of energy systems, *Renewable & Sustainable Energy Reviews*. Accepted 2026.
- J5 Laliwala, C., Amusat, O.O., Ojo, A., Garciadiego, A., Tarka, T., Bhattacharyya, D., **Torres, A.I.**, Design and Optimization of Processes for Recovering Rare Earth Elements from End of Life Permanent Magnets, *AIChE J.*, 2026; e70208.

- J6 Pert, D., **Torres, A. I.**, A framework for dynamic modeling of circular economy networks: the Polyethylene Terephthalate (PET) packaging supply chain as a case study. *Ind. Eng. Chem. Res.*, 64 (22), 10950, 2025.
- J7 Ahmed, A., Nair, A., **Torres, A. I.**, Design and Optimization of Circular Economy Networks - A Case Study of PET. *Comput. Chem. Eng.*, 200, 109164, 2025.
- J8 Chattopadhyay, S., Karthikeyan, K., Gandhi, R., Grossmann, I.E. and **Torres, A.I.**, Optimal retrofit decarbonization in oil refineries. *Ind. Eng. Chem. Res.*, 64 (20), 10131, 2025.
- J9 **Torres, A. I.**, Ferreira, J., Pedemonte, M., “AI and PSE for sustainable chemical processes- A brief review”. *Current Opinion in Green and Sustainable Chemistry*, 51, 2025
- J10 Palav, S., **Torres, A. I.**, Biegler, L., “Systematic conceptual design strategies for the recovery of metals from E-waste”. *Front. Chem. Eng.*, 6, 2024.
- J11 Zhang, L., **Torres, A. I.**, Chen, B., Yuan, Z., Grossmann, I.E. “Optimal Retrofitting of Conventional Oil Refinery into Sustainable Bio-refinery under Uncertainty”. *AIChE Journal*, 2024; e18371. doi:10.1002/aic.18371
- J12 Cárdenas, A., Díaz-Alvarado, F., **Torres, A. I.**, “Green hydrogen production: Process design and capacity expansion integrating economic and operational autonomy objectives”. *Ind. Eng. Chem. Res.*, 63 (1), 358, 2024.
- J13 Piedra-Jimenez, F., **Torres, A. I.**, Rodriguez, M.A., “A robust disjunctive formulation for the forest biomass based fuels supply chain under multiple factors of uncertainty”. *Comput. Chem. Eng.*, 181, 108540, 2024.
- J14 Ferreira, J., **Torres, A. I.**, Pedemonte, M., “A Kaizen Programming algorithm for multi-output regression based on a heterogeneous island model”. *Neural Comput. Appl.*, 35, 9299, 2023.
- J15 Corengia, M., **Torres, A. I.**, “Coupling time varying power sources to production of green-hydrogen: a superstructure based approach for technology selection and optimal design”. *Chem. Eng. Res. Des.*, 183, 235, 2022.
- J16 Ferreira, J., Pedemonte, M., **Torres, A. I.**, “Development of a Machine Learning-based Soft Sensor for an Oil Refinery’s Distillation Column”. *Comput. Chem. Eng.*, 161, 107756, 2022.
- J17 Chaturvedi, T., **Torres, A. I.**, Stephanopoulos, G., Thomsen, M. H., Schmidt, J. E., “Developing Process Designs for Biorefineries-Definitions, Categories, and Unit Operations”. *Energies*, 13(6), 1493, 2020.
- J18 Corengia, M., **Torres, A. I.**, “Operación óptima de baterías bajo el actual régimen tarifario en Uruguay”. *ENERLAC*, 5(1), 56, 2020.
- J19 Ruiz, H. A., Conrad, M., Sun, S.N., Sanchez, A., Rocha, G.J.M., Romaní, A., Castro, E., **Torres, A.**, Rodríguez-Jasso, R.M., Andrade, L.P., Smirnova, I., Sun, R.-C., Meyer, A.S., “Engineering aspects of hydrothermal pretreatment: From batch to continuous operation, scale-up and pilot reactor under biorefinery concept”, *Bioresour. Technol.*, 299, 122685, 2020.
- J20 Mangone, F., Ferreira, J., **Torres, A. I.**, “BISSO: Biomass Interface for Superstructure Simulation and Optimization”, *Processes*, 7(10), 645, 2019.
- J21 Helal, A., Kreimerman, R., Gutiérrez, S., **Torres, A. I.**, “A market-driven algorithm for the assessment of promising bio-based chemicals”, *AIChE J. - Special Edition: “Futures Issue”*, 65(12), e16775, 2019. <https://doi.org/10.1002/aic.16775>

- J22 Corengia, M., **Torres, A. I.**, “Effect of Tariff Policy and Battery Degradation on Optimal Energy Storage”. *Processes*, 6(10), 204, 2018. *Feature paper*.
- J23 Vyhmeister, E., Ruiz-Mercado, G, **Torres, A. I.**, Posada, J., “Optimization of multi-pathway production chains and multi-criteria decision-making through sustainability evaluation: a biojet fuel production case study”. *Clean Technol. Envir.*, 20(7), 1697-1719, 2018.
- J24 **Torres, A. I.**, Stephanopoulos, G., “Design of multi-actor distributed processing systems: a game-theoretical approach”. *AIChE J.- Special Edition “Founders Tribute to Roger Sargent”*, 63, 3369-3391, 2016.
- J25 Dieste, A., Clavijo, L., **Torres, A. I.**, Barbe, S., Oyarbide, I., Bruno, L., Cassella, F., “Lignin from Eucalyptus spp. Kraft Black Liquor as Biofuel”, *Energy & Fuels*, 30(12), 10494-10498, 2016.
- J26 Al Wahedi, Y., **Torres, A. I.**, Al Hashimi, S., Dowling, N., Daoutidis, P., Tsapatsis, M. “Economic assessment of temperature swing adsorption systems as Claus tail gas clean up units”, *Chem. Eng. Sci.*, 126, 186-195, 2015.
- J27 Rajabbeigi, N.*, **Torres, A. I.***, Lew, C. M., Elyassi, B., Ren, L., Wang, Z., Cho, H. J., Fan, W., Daoutidis, P., Tsapatsis, M. “On the kinetics of the isomerization of glucose to fructose using Sn-Beta ”, *Chem. Eng. Sci.*, 116, 235-242, 2014.
- J28 Daoutidis, P., Kelloway, A., Marvin, W. A., Rangarajan, S., **Torres, A. I.**, “ Process systems engineering for biorefineries: new research vistas ”, *Curr. Op. Chem. Eng.*, 2(5), 442-447, 2013.
- J29 Daoutidis, P., Marvin, W. A., Rangarajan, S., **Torres, A. I.**, “Engineering Biomass Conversion Processes: A Systems Perspective ”, *AIChE J.*, 59(1), 3-18, 2013. (Cover article)
- J30 **Torres, A. I.**, Tsapatsis, M., Daoutidis, P., “Biomass to chemicals: Design of an extractive-reaction process for the production of 5-hydroxymethylfurfural”, *Comput. Chem. Eng.*, 42, 130-137, 2012.
- J31 Jogwar, S. S., **Torres, A. I.**, Daoutidis, P., “Networks with Large Solvent Recycle: Dynamics, Hierarchical Control and a Biorefinery Application”, *AIChE J.*, 58(6), 1764-1777, 2012.
- J32 **Torres, A. I.**, Daoutidis, P., Tsapatsis, M., “Continuous Production of 5-Hydroxymethylfurfural from Fructose: a Design Case Study”, *Energy Environ. Sci.*, 3(10), 1560-1572, 2010.
- J33 Margenat, L., **Torres, A.**, Moyna, P., Heinzen, H., Gonzalez, G., Jachmanian, I., “Lanoline Purification by Selective Extraction of Pesticides Using Supercritical CO₂”, *J. Supercrit. Fluid*, 45(2), 177-180, 2008.
- J34 Jachmanian, I., Margenat, L., **Torres, A.**, Grompone, M., “Selectivity of Supercritical CO₂ in the Fractionation of Hake Liver Oil Ethyl Esters”, *J. Am. Oil Chem. Soc.*, 84(6), 597-601, 2007.
- J35 Jachmanian, I., Margenat, L., **Torres, A.**, Grompone, M., “Estabilidad Oxidativa y Contenido de Tocoferoles en el Aceite de Canola Extraído con CO₂ Supercrítico”, *Grasas y Aceites (Spain)*, 57(2), 155-159, 2006.

• Conference papers (all peer reviewed)

- C1 Andrés I. Cárdenas, Víctor A. Soria, Ana I. Torres, Strategic Design of CO₂-Reuse Pathways for Sustainable Aviation Fuel: A Game-Theoretic Techno-Economic Analysis, v5 2026. <https://psecommunity.org/LAPSE:2026.0260>
- C2 Abdulhakeem Ahmed, Nitya Kasera and Ana I. Torres, Predicting Ecotoxicity (HC50) Values Using Symbolic Regression for Transparent Life Cycle Assessment, v5 2026. <https://psecommunity.org/LAPSE:2026.0403>
- C3 Aditya S Khatu, Sampriti Chattopadhyay and Ana I Torres, Pareto-Optimal Pathways for Refinery Decarbonization: Retrofit of Small Modular Nuclear Reactors, v5 2026. <https://psecommunity.org/LAPSE:2026.0245>
- C4 Sampriti Chattopadhyay, Ana I. Torres, Ignacio E Grossmann and Saif R. Kazi, Electrified refineries in the Power Flow Network. Systems and Control Transactions, v5 2026. <https://psecommunity.org/LAPSE:2026.0267>
- C5 Daniel Pert and Ana I. Torres, Multi period optimization of multi agent circular economy networks: application to single use plastics and textiles. Proceedings of the 2026 REMADE Conference.
- C6 Ana I. Torres and Ignacio E. Grossmann, Teaching of Process Design Courses-The CMU experience, trends and challenges. Systems and Control Transactions, v4 2025. <https://psecommunity.org/LAPSE:2025.0512>
- C7 Laliwala C, A., Amusat, O. O., Torres, A. I., An optimization-based law of mass action precipitation/dissolution model. Systems and Control Transactions, v4 2025. <https://psecommunity.org/LAPSE:2025.0496>
- C8 F. Piedra-Jimenez, R. Mehta , V. Larnaudie , M.A. Rodriguez and A.I. Torres, A forest biomass to hydrocarbons supply chain mathematical model for optimizing carbon emissions and economic metrics. Systems and Control Transactions, v4 2025. <https://psecommunity.org/LAPSE:2025.0269>
- C9 F. Piedra-Jimenez, A.I. Torres and M.A. Rodriguez, A comparison of robust modeling approaches to cope with uncertainty in independent terms, considering the forest supply chain case study. Systems and Control Transactions, v4 2025. <https://psecommunity.org/LAPSE:2025.0365>
- C10 Daniel Pert and Ana I. Torres, A System-Dynamics Based Approach for Modeling Circular Economy Networks: Application to the Polyethylene Terephthalate (PET) supply chain. Systems and Control Transactions, v4 2025. <https://psecommunity.org/LAPSE:2025.0247>
- C11 Keerthana Karthikeyan, Sampriti Chattopadhyay, Rahul Gandhi, Ignacio E Grossmann and Ana I. Torres, Pareto optimal solutions for decarbonization of oil refineries under different electricity grid decarbonization scenarios. Systems and Control Transactions, v4 2025. <https://psecommunity.org/LAPSE:2025.0287>
- C12 Ahmed, A., Torres, A. I., “Material Flow Efficiency Assessment of Optimized Circular Polyethylene Terephthalate Networks”. Proceedings of the 2024 REMADE Conference.
- C13 Laliwala C, A., Torres, A. I., “Design and Optimization of Processes for Recovering Rare Earth Elements from End-of-Life Hard Disk Drives.” Proceedings of the 2024 FOCAPD Conference.
- C14 Ahmed, A., Torres, A. I., “Design and Optimization of Circular Economy Networks: A Case Study of Polyethylene Terephthalate (PET)”. Proceedings of the 2024 FOCAPD Conference.

- C15 Chattopadhyay S., Gandhi, R., Grossmann, I.E., Torres, A. I. "Optimization of Retrofit Decarbonization in Oil Refineries". Proceedings of the 2024 FOCAPD Conference.
- C16 Laliwala C, A., Torres, A. I., "Recycling Rare Earth Elements from End-of-Life Electric and Hybrid Electric Vehicle Motors". Proceedings of the 2024 ESCAPE/PSE Conference.
- C17 Zhang,L, **Torres, A. I.**, Chen, B., Yuan, Z., Grossmann, I.E., "Optimal Retrofitting of Conventional Oil Refinery into Sustainable Bio-refinery under Uncertainty ", *Comput. Aided Chem. Eng.* 51, Eds. Kokossis, A., Georgiadis, M.C., Pistikopoulos, E., 2023.
- C18 Ferreira, J., Pedemonte, M., **Torres, A. I.**, " Learning interpretable multi-output models: Kaizen Programming based symbolic regression for estimating outlet concentrations of a splitter" , *Comput. Aided Chem. Eng.* 51, Eds. Kokossis, A., Georgiadis, M.C., Pistikopoulos, E., 2023.
- C19 Avraamidou, S. **Torres, A. I.**, " Circular Economy: Definitions, Challenges, and Opportunities", Proceedings FOCAPO-CPC 2023.
- C20 Arsuaga, J. **Torres, A. I.**, "A data driven model for prediction of adsorption energies on metallic surfaces". *Comput. Aided Chem. Eng.* 51, Eds. Montastruc, L., Negny, S., 2022.
- C21 Ferreira, J., Pedemonte, M., **Torres, A. I.**, "A multi-output machine learning approach for surrogate modeling generation in process engineering", *14th International Symposium on Process Systems Engineering*, 2022.
- C22 Ferreira, J., **Torres, A. I.**, Pedemonte, M., "Towards a Multi-Output Kaizen Programming Algorithm, *7th IEEE Latin American Conference on Computational Intelligence LA-CCI 2021*. 2021.
- C23 Corengia, M., Estefan, N., **Torres, A. I.**, "Analyzing Hydrogen Production Capacities to Seize Renewable Energy Surplus". *Comput. Aided Chem. Eng.* 48, Eds. Pierucci, S., Manenti, F., Bozzano, G. L. & Manca, D., 1549-1554, 2020.
- C24 Ferreira, J., **Torres, A. I.**, Pedemonte, M., "A comparative study on the numerical performance of Kaizen programming and genetic programming for symbolic regression problems", *6th IEEE Latin American Conference on Computational Intelligence LA-CCI 2019*, Guayaquil, Ecuador, 2019
- C25 Ferreira, J., Pedemonte, M., **Torres, A. I.**, "A genetic programming approach for construction of surrogate models", *Comput. Aided Chem. Eng.* 47, Eds. Muñoz, S. G., Laird, C. D. & Realff, M. J., 451-456, Elsevier, 2019.
- C26 Corengia, M., **Torres, A. I.**, " Operación óptima de baterías bajo el actual régimen tarifario", *II Congreso de Agua Ambiente y Energía*, Montevideo, Uruguay, 2019.
- C27 Estefan, N., **Torres, A. I.**, Bussi,J., "Síntesis, caracterización de catalizadores y evaluación tecno-económica del procesos de síntesis de Fischer- Tropsch a partir de Biosingás", *X Congreso Argentino de Ingeniería Química-CAIQ2019*, Santa Fé, Argentina, 2019.
- C28 Corengia, M., **Torres, A. I.**, "Two-phase Dynamic Model for PEM Electrolyzer", *Comput. Aided Chem. Eng.* 44, Eds. Eden, M. R., Ierapetritou, M. G. & Towler, G. P., 1435-1440, Elsevier, 2018.
- C29 **Torres, A. I.**, Helal, A., Ures, P., Estefan, N., Kreimerman, R., Gutiérrez, S., "Selección de productos y tecnologías para valorización de residuos de biomasa: PLA como caso de

- estudio” *Ier Congreso Nacional de Gestión Sostenible de Residuos ímica*, Montevideo, Uruguay, 2017.
- C30 Gutiérrez, S., Philippi, C., Kreimerman, R., Ures, P., **Torres, A. I.**, “Relevamiento de la biomasa disponible en Uruguay utilizable como materia prima en la producción de químicos”, *Actas del VI Encuentro Regional de Ingeniería Química*, Montevideo, Uruguay, 2017.
- C31 **Torres, A. I.**, Philippi, C., Ures, P., Kreimerman, R., Gutiérrez, S., “Creación de herramienta computacional para la simulación de procesos de conversión de biomasa”, *Actas del VI Encuentro Regional de Ingeniería Química*, Montevideo, Uruguay, 2017.
- C32 **Torres, A. I.**, Bochénski, T., Schmidt, J. E., Stephanopoulos, G., “Economically optimal multi-actor processing networks: material flows and price assignment of the intermediates using Lagrangian decomposition”, *Comput. Aided Chem. Eng.* 38, Eds. Kravanja, Z. & Bogataj, M., Elsevier, 2016.
- C33 Ashraf, M. T., **Torres, A. I.**, Cybulska, I., Fang, C. J., Thomsen, M. H., Schmidt, J. E., Stephanopoulos, G., “Optimization of Lignocellulosic Waste Biorefinery using Multi-Actor Multi-Objective Mathematical Framework”, *Comput. Aided Chem. Eng.* 38, Eds. Kravanja, Z. & Bogataj, M., Elsevier, 2016.
- C34 Bochénski, T(*), **Torres, A. I. (*)**, Ashraf, M. T., Schmidt, J. E., Stephanopoulos, G., “Evaluation of the production of lipids for fuels and proteins from microalgae by decomposition of the processing network”, *Comput. Aided Chem. Eng.* 38, Eds. Kravanja, Z. & Bogataj, M., 1635-1640, Elsevier, 2016. (*) Equal contribution.
- C35 **Torres, A. I.**, Cybulska, I., Fang, C.J., Thomsen, M. H., Schmidt, J. E., Stephanopoulos, G. “A novel approach for the identification of economic opportunities within the framework of a biorefinery”, *Comput. Aided Chem. Eng.* 37, Eds. Gernaey, K. V., Huusom, J. K. & Gani, R., 1175-1180, Elsevier, 2015
- C36 Bonk, F., Chaturvedi, T., **Torres, A. I.**, Schmidt, J. E., Thomsen, M. H., Stephanopoulos, G., “Exploring opportunities for the production of chemicals from municipal solid wastes within the framework of a biorefinery”, *Comput. Aided Chem. Eng.* 37, Eds. Gernaey, K. V., Huusom, J. K. & Gani, R., 2123-2128, Elsevier, 2015.
- C37 Daoutidis, P., Marvin, W. A., Rangarajan, S., **Torres, A. I.**, “Process Engineering of Biorefineries: Recent Results and New Research Vistas”, *Proceedings FOCAPO 2012 / CPC VIII*, Foundations of Computer-Aided Process Operations - Chemical Process Control Engineering Conferences, Savannah, GA, 2012.
- C38 **Torres, A. I.**, Tsapatsis, M., Daoutidis, P., “Biomass to chemicals: Design of an extractive-reaction process for the production of 5-hydroxymethylfurfural”, *Comput. Chem. Eng.* 42, Eds. Pistikopoulos, E., Georgiadis, M. & Kokossis, A., 236-240, Elsevier, 2011.

FUNDING AND RESEARCH PROJECTS

- “Decarbonized hydrogen, carriers, and sustainable aviation fuels production for the western PA area”
2025-2026
Sponsor: Scott Energy Institute- Seed Grant . Role: Principal Investigator. Total award amount: USD 75,000.
- “Develop Environmentally Friendly Processing Methods for Alternative TREO source REM Feeds”
2024-2026

Sponsor: *Naval Nuclear Laboratory*. Role: co- Principal Investigator. Total award amount: 1,000,000 USD (Torres share USD 219,862).

- “*Modeling, optimization, and equilibrium formulations for the analysis and design of circular economy networks*” 2024-2029
Sponsor: *NSF: CBET (CAREER Award)*. Role: Principal Investigator. Total award amount: USD 517,994.
- “*Process Optimization and Modeling for Minerals Sustainability (PrOMMiS)*” 2023-2026
Sponsor: *DOE*. Role: Principal Investigator. Total award amount: USD 498,942 (USD 249,471 Torres share).
- “*Transitioning to decarbonized chemical industries: computational methods for decision making*” 2023-2024
Sponsor: *Pennsylvania Infrastructure Technology Alliance (PITA)*. Role: Principal Investigator. Total award amount: USD 61,726.
- “*Diseño y evaluación de alternativas tecnológicas para el desarrollo de bio-refinerías*” 2019-2021
Design and evaluation of technologies for the development of bio-refineries (in Uruguay)
Sponsor: *Fondo Sectorial de Energía, ANII*. Grant FSE_1_2018_1_152900. Role: Principal Investigator. Total award amount: USD 100,000.
- “*Desarrollo de proceso para captura de CO₂ en industria del cemento*” 2018-2019
Development of a CO₂ capture process for the cement industry
Sponsor: *Herramientas para la Innovación, ANII- Cementos Artigas S.A.*
Grant HPI_X_2018_1_147304. Role: Principal Investigator for Udelar. Total award amount USD 50,000; USD 20,000 ANII + USD 30,000 industry’s cost-share over 8 months.
- “*Biorefinerías en Uruguay: Evaluación tecno-económica de la producción de combustibles y químicos a partir de materia prima y residuos nacionales*” 2015-2018
Biorefineries in Uruguay: technoeconomic evaluation of the production of fuels and chemicals from uruguayan raw materials and residues
Sponsor: *Fondo Sectorial de Energía, ANII*. Grant FSE_1_2015_1_109976. Role: Principal Investigator. Total award amount: USD 100,000.
- Others: Special EWO/ESI projects with CAPD sponsors, 2023-2026, 75,000 USD (industrial gifts).

PROFESSIONAL SERVICE AND OUTREACH

• Consulting Assignments

- United Nations Industrial Development Organization (UNIDO) 2024
Evaluator of GEF project “Strengthening of National Initiatives and Enhancement of Regional Cooperation for the Environmentally Sound Management of POPs in Waste of Electronic or Electrical Equipment (WEEE) in Latin-American Countries”. Total 20 days in the period between 07/21/2024 to 11/30/2024.
Report available at <https://www.unido.org/publications/ot/9664440/pdf>

• Editorial Assignments

- *Clean Technologies and Environmental Policy*- Springer Associate Editor 2024 -2026
- *Processes*- MDPI Invited Editor “Process Systems Engineering à la Canada” since 2018
- *Computational Methods in Chemical Engineering*- *Frontiers* Member Editorial Board since 2021
- *Clean Technologies and Environmental Policy*- Springer Member Editorial Board since 2018

• Professional Organizations and Conferences

- Board Member- Institute for Sustainability *American Institute of Chemical Engineers*, since 2024
- Director- Environmental Division *American Institute of Chemical Engineers*, since 2024
- Programming Chair - Sustainable Engineering Forum Area 23B Sustainable Biorefineries, *American Institute of Chemical Engineers Annual Meeting*, 2022, 2023
- Organization of the “Simposio de Bio-energía y Bio-refinerías”, *Congreso Iberoamericano de Ingeniería Química* (Santander, España, 2019)
- Scientific Committee Member of: *Foundations of Computer Aided Process Operation - Chemical Process Control* (Tucson Arizona 2027), *Iberoamerican Congress of Chemical Engineering (CIBIQ)* (Lisbon, Portugal, 2025), *European Symposium of Computer-Aided Process Engineering* (Florence, Italy, 2024), *Foundations of Computer-Aided Process Design* (Breckenridge, Colorado, 2024), *European Symposium of Computer Aided Process Engineering* (Athens, Greece, 2023), *11th World Congress in Chemical Engineering Special Event on Process Systems Engineering (PSE) Methods and Tools* (Buenos Aires, Argentina, 2023), *Process Systems Engineering Conference* (Kyoto, Japan, 2021), *Process Systems Engineering Conference* (San Diego, USA, 2018), *Congreso de la Asociación Argentina de Ingeniería Química* (2017)
- Session Chair/Co-chair: *American Institute of Chemical Engineers Annual Meeting* (Design of Integrated Biorefinery 2015, Process Design 2017, Biofuels production: Design, Simulation and Techno-economic Analysis 2017 to 2020, Value added co-products from biorefineries 2017)
- Others:
 - ◊ Rapid Manufacturing Institute: (American Institute of Chemical Engineers) Roadmapping organizing committee. By invitation, 2024-2025.

• Reviewer Experience

- Reviewer for: *Clean Technologies and Environmental Policy*, *American Institute of Chemical Engineers Journal*, *Chemical Engineering Research & Design*, *Bioethanol*, *Journal of Cleaner Production*, *Separation and Purification Technology*, *Biochemical Engineering Journal*, *Chemical Engineering Science*, *Waste and Biomass Valorization*, *Bioenergy Research*, *Applied Sciences*, *BMC Chemical Engineering*, *Latin America Applied Research*, *Chemical Engineering and Processing - Process Intensification*, *Industrial & Engineering Chemistry Research*, *Computers & Chemical Engineering*.

• Proposal (grants/project) Reviewer Experience

- Reviewer for:
 - ◇ Deutsche Forschungsgemeinschaft (German Research Foundation, 2024)
 - ◇ *Chemical, Bioengineering, Environmental, and Transport Systems* - National Science Foundation (since 2023)
 - ◇ *Petroleum Research Fund*- American Chemical Society-ACS (2022)
 - ◇ *SENACYT- Panamá (Panamá's equivalent to NSF)* - Reviewer for several FIED (Fomento a I+D para egresados de estudios de doctorado) (2021)
 - ◇ *FONCyT Fondo para la Investigación Científica y Tecnológica* - Argentina Proyectos de Investigación Científica y Tecnológica (PICT) (2019)
 - ◇ *ANII Agencia Nacional de Investigación e Innovación* - Uruguay Reviewer for several projects (since 2018).
 - ◇ *CSIC Comisión Sectorial de Investigación Científica* - Uruguay. Programa de Iniciación a la Investigación (2017)
- Member of the evaluation board: *PhD, MSc grants for graduate students* (Science & Technology branch, CAP, Udelar 2016-2021)
- **Others:** Member Uruguayan government advisory group for the generation of an academic roadmap to enable the development of the green-hydrogen value chains. 2022-2023

• Academic Committee Service

- CMU, College of Engineering Diversity Committee 2022-2024
- CMU, College of Engineering Undergraduate Curriculum Assessment Coordination Committee 2022-2024.
- CMU, Department of Chemical Engineering, Faculty Search Committee 2025
- CMU, Department of Chemical Engineering, Graduate Recruiting and Admissions 2025
- CMU, Department of Chemical Engineering Undergraduate Program Committee 2022-2025.
- CMU, Department of Chemical Engineering ad-hoc Department Head Search Committee 2024.
- CMU, Department of Chemical Engineering ad-hoc ABET Committee 2023-2024.
- CMU, Department of Chemical Engineering PhD Qualifiers 2022-2024.
 - ◇ Chair 2024
- Udelar, Central Care Commission, Representative of the Area of Technologies, Natural Sciences and Habitat (Colleges of Engineering, Architecture, Chemistry and Sciences) 2020-2022
- Udelar, College of Engineering, Administrative Affairs Committee 2019-2022
- Udelar, Department of Chemical Engineering, Institute Governance Committee - Faculty representative 2017-2018
- Udelar, Department of Chemical Engineering, Undergraduate Studies Committee - Faculty representative 2017-2018

TEACHING ASSIGNMENTS

Department of Chemical Engineering, Carnegie Mellon University

Graduate: Process Systems Modeling/Design and Optimization of Sustainable Processes (Instructor Spring 2025, Spring 2026), Chemical and Reactive Systems (Instructor, Fall 2022), PSE Seminar (Instructor, Fall 2022, Spring 2023, Fall 2023, Spring 2024, Fall 2024, Spring 2025);

Undergraduate: Chemical Process Systems Design (Instructor, Fall 2023, Fall 2024, Fall 2025), Mathematical Methods of Chemical Engineering (Instructor, Spring 2023).

Department of Chemical Engineering, UdelaR, Uruguay

Undergraduate: Modeling Simulation and Optimization of Chemical Processes/ Chemical Process Design (Professor in charge Fall 2015-2017, Spring 2019-2021), Fluid dynamics (Lecturer, Fall 2018-2019).

Department of Chemical Engineering and Materials Science, University of Minnesota

Teaching Assistant: Graduate Applied Mathematics (Fall 2011), undergraduate Process Design (Fall 2009), undergraduate Mass Transfer and Separation Processes (Spring 2008). Chemical Rate Processes. Delivered lecture on "Introduction to non-linear parameter estimation" (Spring 2012).

School of Chemistry, UdelaR, Uruguay

Lab Assistant: Undergraduate Physical Chemistry II (Fall 2001, Fall 2002), undergraduate Electrochemistry (Spring 2002, Spring 2003).

RESEARCHERS SUPERVISED**• Doctoral (Chemical Engineering and CMU, unless noted):**

1. Andrés Cárdenas, Fall 2024-present
2. Robert Maligon Querimit , Fall 2024-present
3. Daniel Pert, Fall 2023-present
4. Abdulhakeem Ahmed, Fall 2022-present
5. Sampriti Chattopadhyay, co-advised with Prof. I. Grossmann, Fall 2022-present,
6. Christopher Laliwala, Fall 2022-present
7. Jimena Ferreira (Udelar), co-advised with Prof. M. Pedemonte, Spring 2018- Fall 2022. Next: Assistant Professor, Department of Chemical Engineering and Department of Computer Science, Udelar, Uruguay
8. Mariana Corengia (Udelar), Fall 2017- Fall 2022. Next: Assistant Professor, Department of Chemical Engineering, Udelar, Uruguay

• Masters (Chemical Engineering and CMU, unless noted):

1. Benjamin Gu, co-advised with Prof. D. Battacharya (WVU), present.
2. Amogh Amonkar, co-advised with Dr. V. Alves, graduated 2025. Next: PhD student at Carnegie Mellon University.
3. Aditya Khatu, graduated 2025. Next: Research Associate, Department of Chemical Engineering, Carnegie Mellon University.
4. Nitya Kasera, graduated 2025. Next: PhD student at University of Pittsburgh.

5. Soham Joshi, graduated 2025. Next: Research Associate, Department of Chemical Engineering, Carnegie Mellon University.
6. Victor Soria Alcaide, graduated 2024. Next: Inprocess Technology & Consulting Group, S.L.
7. Rishabh Mehta, graduated 2024. Next: Tesa.
8. Samuel Chai, Integrated Masters Bachelor's degree, graduated 2024.
9. Valeria González (Udelar), co-advised with Prof. M. Corengia, graduated 2024 (Udelar, Uruguay). Next: Regulatory Unit of Energy and Water Services, Uruguay (URSEA).
10. Akhil Nair, co-advised with Prof. C. Laird, graduated 2022. Next: Corning Inc.
11. Samarth Palav, co-advised with Prof. L. Biegler, graduated 2022. Next: Disa.
12. Nicolás Estefan (Chemistry, Udelar), co-advised with Prof. J. Bussi, graduated 2020 (Udelar, Uruguay). Next: Doctoral researcher Forschungszentrum Julich, Germany.

• **Undergraduate (CMU unless noted):**

1. Tejesh Singh Sandhu, 2025-2026
2. Juhee Park, 2025-2026
3. Chris Lee, 2024-2026
4. Yonseoo Cha, 2025
5. Keerthana Karthikeyan, 2023-2025
6. Zeynep Orucu, 2024
7. Kamil Sparenberg, 2023
8. Melvin Ofosu Koranteng, 2022-2023
9. Kevin Chang, 2022
10. Agustín Porley (Udelar), 2020-2021
11. Valeria González (Udelar), 2019-2021
12. Joana Auriello (Udelar), 2019-2021
13. Martín Tejera (Udelar), 2018-2019
14. Franco Mangone (Udelar), 2018-2019
15. Agustín Helal (Udelar), 2016-2018
16. Pablo Ures (Udelar), 2016-2017
17. Carlos Philippi (Udelar), 2016

• **Visitors:**

1. Wonho Jung, Research Professor, Sogang University, South Korea, 2025-2026
2. Frank Piedra Jiménez, Postdoc, Universidad de Córdoba, Argentina, 2025-2026
3. Andrés Cárdenas, MS Student, Universidad de Chile, Chile, 2024
4. Margarita Charalambous, PhD student, ETH Zurich, Switzerland, 2024
5. Sachin Jog, PhD student, ETH Zurich, Switzerland, 2024