Research and work experience

Postdoc researcher | University of Udine, Italy *05/2023 – Present*

- Developed a systematic approach to the preparation of Dual-Function Materials (DFMs) for CO_2 capture and conversion to CH_4/CO, optimising synthesis, testing and characterisation through Design of Experiment methodologies
- Optimised solventless mechanochemical synthesis of Ru-based DFMs achieving CO_2 capture capacities >420 ∧mol/g_{DFM} and CH_4 yields >380 ∧mol/g_{DFM}, advancing catalyst performance benchmarks
- Led a comprehensive screening study on Zr-based perovskite DMFs, selecting compositions, designing research methodologies and analysing results to identify chemical trends
- Performed *in situ* characterisation (Raman microscopy, DRIFTS, NAP-XPS) to explain DFMsô reactivity
- Collaborated across multiple internal projects to troubleshoot experimental challenges, provide analytical insights, and train PhD students in experimental setup, data analysis, and catalyst synthesis

PhD Researcher | Universitat Politècnica de Catalunya, Barcelona, Spain *10/2019 – 03/2023*
Marie Skłodowska Curie PhD Fellowship (H2020) within BIKE network

- Investigated bimetallic Ni-Fe and Pt-Ni catalysts for methane steam reforming to produce H_2 and syngas aiming for stable and coke resistant catalysts
- Explored the use of ball milling as green chemistry alternative to impregnation, screening several compositions and supports
- Designed and conducted *in situ* and *operando* synchrotron-based experiments (NAP-XPS, XRD, and XAFS) to study materials under relevant reaction conditions
- Enhanced material performances and mechanistic understanding through comprehensive data analysis and application of statistical Design of Experiment
- Trained and mentored PhD colleagues in materials science theory, characterisation techniques, and data analysis, improving research quality and experimental outcomes of the research group

Visiting PhD researcher | Karlsruher Institut für Technologie, Karlsruhe, Germany *01/2022 – 03/2022*

- Prepared CeO_2 and Pt/CeO_2 materials by Flame Spray Pyrolysis
- *Operando* characterisation of PtNi/CeO_2 catalysts by XAS measurements

Visiting PhD researcher | CNR ICCOM-SCITEC, Pisa and Milan, Italy *01/2021 – 04/2021*

- Preparation of bimetallic NiFe and PtNi catalysts by organometallic synthesis and Metal Vapour Synthesis approach and extensive TEM characterisation training

Laboratory technician | Colorificio ZetaGi SpA, Creazzo, Italy *10/2018 – 05/2019*

- Laboratory testing and quality control for anticorrosion industrial coatings

R&D researcher internship | Progold SpA, Trissino, Italy *05/2018 – 09/2018*

- Assisted development of silver alloys for jewelry for target hardness post-casting avoiding double thermal treatments
- Simplified testing procedure linking direct post-cast hardness and single-step low-temperature hardening saving time and process cost
- Analysed a dataset of 160+ alloys identifying patterns, proposes a new composition with highest hardness during the project

Master's thesis intern | Università di Padova, Italy *02/2017 – 12/2017*

- Preparation and characterisation of Au-based Raman-active nanoprobes by Laser Ablation synthesis
- *In vitro* targeting and detection of lung cancer cells by Raman microscopy

Laboratory technician | Acque vicentine SpA, Vicenza, Italy *01/2011 – 12/2012*

- Chemical and microbiological analysis of aqueduct and waste water with field sampling

Education

PhD in Chemical Process and Engineering, cum laude *09/2019 – 01/2024*
Univsersitat Politècnica de Catalunya, Barcelona, Spain

MSc in Materials Science, 110/110 *10/2015 – 12/2017*
Università di Padova, Italy

BSc in Materials Science, 105/110 *10/2012 – 10/2015*
Università di Padova, Italy

Skills

- **Preparation of nanomaterials** I Ball milling, precipitation, sol-gel, self-combustion, hydrothermal, colloidal, flame spray pyrolisis, laser ablation, impregnation
- **Charaterisation techniques**I XRD, XPS, XAS, micro-Raman, UV-VIS, fluorescence, DRIFTS, BET-BJH, TGA, TPR, TPD, SEM-EDX, HR-TEM, extensive experience in synchrotron experiments, *in situ* and *operando* measurements
- **Data analysis and experimental design** I Advanced use of OriginLab, proficient in CasaXPS, GSAS-II, Rietveld refinement, experienced in Design of Experiment with Minitab
- **Informatics** I Python scripting for data analysis, LaTeX, ImageJ, advanced knowledge of Microsoft and Linux OSs, strong experience with Microsoft Office, virtual machines, project and time management with Obsidian and Notion
- **Soft skills** I Fast and independent learning, interdisciplinary approach, driven by high curioisty, strong teaching attitude, independent yet very collaborative, well organised and methodic, goal driven, highly attentive to details, with a strong theoretical background guiding both data analysis and chemical expertise.

Languages

Italian ï native I **English** ï fluent listening and speaking I **Spanish** ï fluent listening and intermediate speaking
Catalan ï fluent listening and beginner speaking

List of publications

Braga, A; Felli, A.; Strazzolini, A.; Danielis, M; Colussi, S. and Trovarelli, A. ï Tuning A-Site Chemistry in $AZrO_3$ Perovskites for Integrated CO_2 Capture and Methanation, *Applied Catalysis A: General, submitted*

Braga, A.; Armengol-Profit· s, M.; J. Divins, N.; Llorca, J. et al. ï Bimetallic $PtNi/CeO_2$ catalysts prepared by mechanochemistry for methane steam reforming, *ACS Catalysis, in review*

Braga, A.; Danielis, M.; Colussi, S. and Trovarelli, A. ï Rational Screening of Mechanochemical Parameters for the Synthesis of $RuNa/Al_2O_3$ Dual Function Materials for the Integrated CO_2 Capture and Methanation, *RSC Mechanochemistry, 2025, Advance Article*

Felli, A.; Toso, A.; **Braga, A.**; Trovarelli, A. et al. ï Perovskite-derived $MnO_x/LaMnO_3$ Nanocomposites to boost CO oxidation activity, *Catalysis science and Technology,* 2025

Armengol-Profit¸ s, M.; **Braga, A.**; J. Divins, N.; Llorca, J. et al. ï Enhancing the performance of a novel $CoRu/CeO_2$ bimetallic catalyst for the dry reforming of methane via a mechanochemical process, *Applied Catalysis B,* 2024, 123624

Danielis, M.; Merkouri, L.-P.; **Braga, A.**; Trovarelli, A.; Duyar, M.S.; Colussi, S. ï Feasibility of green mechanochemical synthesis for dual function materials preparation, *Journal of CO_2 Utilization*, 2024, 102895

Danielis, M.; **Braga, A.**; Divins, N.J.; Llorca, J.; Trovarelli, A.; Colussi, S. ï Relevant Parameters for the Mechanochemical Synthesis of Bimetallic Supported Catalysts, *Crystals*, 2023, 13(12), 1685

Braga A.; Armengol-Profit· s, M.; J. Divins, N.; Llorca, J. et al. ï Bimetallic NiFe Nanoparticles Supported on CeO_2 as Catalysts for Methane Steam Reforming, *ACS Applied Nano Materials,* 2023 6, 9, 7173ï 7185

J. Divins, N.; **Braga, A.**; Danielis, M.; Colussi, S., Trovarelli, A., Llorca, J. et al. ï Investigation of the evolution of Pd-Pt supported on ceria for dry and wet methane oxidation, *Nature Communications,* 2022, 13, 5080

Mazzucca, C; [...] **Braga, A.**; [...] Meneghetti, M. et al. ï Understanding the good and poor cell targeting activity of gold nanostructures functionalized with molecular units for the epidermal growth factor receptor, *Nanoscale advances,* 2019, 1, 1970