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João Castro Gomes is currently Full Professor at the Faculty of Engineering, University of Beira Interior. He is a member of the Department of Civil Engineering and Architecture and a member of the Research Unit “C-MADE - Centre of Materials, Environment and Building Technologies” funded by FCT (Portuguese national foundation for science and technology), Since 2007.

He concluded his Doctor of Philosophy Degree (PhD) in Mathematical models for assessing cement hydration and microstructure of cement pastes, in 1997 at University of Leeds (UK) and joined afterwards the Department of Civil Engineering at University of Beira Interior (UBI). Since then he was particularly involved in the installation of different research laboratories for materials and construction technology at UBI, namely the laboratory of durability of materials. He was also responsible for the implementation of the first Master Course (<http://www.mreamb.ubi.pt/planoestudos.htm>) and for running the first Erasmus program and the establishment of first Doctoral Program of studies in Civil Engineering at UBI.

During his scientific activity has been involved and coordinated several research projects granted by highly competitive National and European Research Calls, some of them involving SMEs and industry (e.g. eCO2CRETE: Environment-friendly concrete for the capture of CO<sub>2</sub> in the built environment, granted by the Qatar National Research Fund, with project NPRP13S-0123-200158, Period 2021-2024, project value US\$700.000,00, and UBI funding US\$194.000,00; REMINE- Reuse of Mining Waste into Innovative Geopolymeric-based Structural Panels, Precast, Ready Mixes and *In situ* Applications, granted by the European Commission under Horizon 2020 MARIE Skłodowska-CURIE Actions, Research and Innovation Staff Exchange (RISE), with project N. 645696, period 2015-2018, project value of EUR 567.000,00 and UBI funding EUR 108.000,00; GEOGREEN – Waste geopolymeric binder-based natural vegetated panels for energy-efficient building green roofs and facades. Period: 2011-2013. FCT grant. UBI funding: EUR 152.832,00; SELICON - Service life design: modelling the durability performance of Concrete. Period: 2008-2011. FCT grant. UBI funding: EUR 31.900,00; VALREMIN – Valorisation of mining wastes. Period 2006-2008. ADI grant. UBI funding: 49.300,00; REEQ – FCT scientific re-equipment: Study of new construction systems, concrete composition and bituminous mixes, with incorporating materials, for better performance and durability on climates with high thermal amplitudes. Period: 2006. FCT grant. UBI funding: EUR 375.000,00; AGREDUR - Influence of physical properties and morphological parameters of granite and calcareous aggregates on the durability of concrete. Period 2000-2004. FCT grant. UBI funding: EUR 25.000,00).

As a result of his scientific activity, his research work has been recognized and awarded several prizes related to carbon capture and utilization in the construction industry (1st Prize Climatelaunchpad Global competition 2018 - EIT Climate KIC, 1st prize Manuel António da Mota Foundation 2018, worth of €50,000.00 with the idea for development of pilot production of building blocks obtained with waste and carbon dioxide, Winner idea within “Promove Regiões Fronteiriças/Promoting Border Regions” 2019 edition supported by the La Caixa Foundation/BPI and

1st Prize awarded by TAKE-OFF Project – Building Global Technology Entrepreneurs for Advanced Materials 2020 given to DARKCO2 business idea).

Currently (2018-) João Castro Gomes is scientific coordinator of C-MADE Centre of Materials and Building Technologies R&D unit. He was also C-MADE coordinator between 2008 and 2014, having been responsible for its foundation in 2007. Regarding doctorate studies supervision, he is currently supervising 8 students for obtaining the doctorate degree award. Previously, he has successfully supervised 4 students and co-supervised other 5 students. His research interests are on the development of multifunctional and sustainable cementitious materials. Castro-Gomes is currently conducting research activities in the following areas: Up-Cycling Wastes into Smart Cementitious Materials; Storage of CO<sub>2</sub> and Methane in Concrete Materials; Durability Testing Methods of Cementitious Materials and Effect of Climate Change on Critical Infrastructure.

### Latest 6 publications in international journals with peer review:

Benhamouda, A., Castro-Gomes, J. and Pereira-de-Oliveira, L. (2021). Rheology, Mechanical Properties and Porosity of Ternary Alkali-Activated Binders Based on Mining Mud Waste with Waste Glass and Metakaolin', *CivilEng*, 2(1), pp. 236–253. doi: 10.3390/civileng2010013.

Sedira, N. and Castro-Gomes, J. (2020). Alkali-Activated Binders Based on Tungsten Mining Waste and Electric-Arc-Furnace Slag : Compressive Strength and Microstructure Properties. *CivilEng*, 1(2), pp. 154–180. doi: <https://doi.org/10.3390/civileng1020010>.

Sedira, N. and Castro-Gomes, J. (2020). Effect of activators on hybrid alkaline binder based on tungsten mining waste and ground granulated blast furnace slag, *Construction and Building Materials*. Elsevier Ltd, 232, p. 117176. doi: 10.1016/j.conbuildmat.2019.117176.

Beghoura, I., & Castro-Gomes, J. (2019). Design of alkali-activated aluminium powder foamed materials for precursors with different particle sizes. *Construction and Building Materials*, 224, 682–690. <https://doi.org/10.1016/J.CONBUILDMAT.2019.07.018>.

Humbert, P. S., Castro-Gomes, J. P., & Savastano, H. (2019). Clinker-free CO<sub>2</sub> cured steel slag based binder: Optimal conditions and potential applications. *Construction and Building Materials*, 210, 413–421. <https://doi.org/10.1016/j.conbuildmat.2019.03.169>.

Humbert, P. S., & Castro-Gomes, J. (2019). CO<sub>2</sub> activated steel slag-based materials: A review. *Journal of Cleaner Production*, 208, 448–457. <https://doi.org/10.1016/J.JCLEPRO.2018.10.058>.

### Patents:

Castro-Gomes, J., & Humbert, P. (2019). Obtaining CaO-MgO binders and construction products with reuse of by-products and/or waste and carbon dioxide absorption. Portugal. Patent PT 110895.

Castro-Gomes, J., & Manso, M. (2017). System of modular parts for the execution of vegetated surfaces capable of thermally improving the building envelop. Portugal. Patent PT 109260 A.

Castro-Gomes, J., Kheradmand, M., Azenha, M., Silva, P. D., de Aguiar, J. L. B., & Zoorob, S. E. (2018). Assessing the feasibility of impregnating phase change materials in lightweight aggregate for development of thermal energy storage systems. Portugal. Patent 108276.

Manso, M., Castro-Gomes, J., Virtudes, A., Albuquerque, A., & Lanzinha, J. C. (2014). System of modular parts for the execution of vegetated surfaces on the building envelop. Portugal. Patent PT 106022 B.

Kastiuskas, G.; Zhou, X. Tai Wan, K. and Castro-Gomes, J. (2018). Lightweight Alkali-Activated Material from Mining and Glass Waste by Chemical and Physical Foaming. Portugal. (Provisional PT 115009).

Torgal, F., Castro-Gomes, J., Jalali, S. (2012). Produção de aditivos pozolânicos a partir de lamas de tungsténio para substituição parcial de cimento Portland em argamassas e betões. Portugal. Patent PT 104979.

### **Concluded R&D funded projects:**

Coordinator of H2020 MSCA (RISE), REMINE project – Reuse of Mining Waste into Innovative Geopolymeric-based Structural Panels, Precast, Ready Mixes and *In situ* Applications, Period: 2014-2018. Project No. 645696. <https://reminemsca.wordpress.com>. Total EU funding: EUR 567.000,00.

Coordinator of activity 7 within the EFATRAS – Environmentally-friendly aeronautical transport systems integrated program. Period: 2013-2015. <http://efatrasubi.wordpress.com>. Centro F: EUR 201.187,00.

Coordinator of GEOGREEN project – Waste geopolymeric binder-based natural vegetated panels for energy-efficient building green roofs and facades. <https://geogreenmade.wordpress.com>. Period: 2011-2014. Total FCT funding: EUR 152.832,00.

Scientific coordinator of C-MADE Centre of Materials and Building Technologies R&D unit at UBI, since 2018 and between 2008 and 2014.

### **Ongoing R&D projects (2019):**

Unit I&D 4082, C-MADE, Centre of Materials and Building Technologies, UIDB/04082/2020 and UIDP/04082/2020. Period: 2020-2023. Total funding: EUR 298.680,00, UBI funding 249.576,00.

eCO2CRETE: Environment-friendly concrete for the capture of CO<sub>2</sub> in the built environment, granted by the Qatar National Research Fund, with project NPRP13S-0123-200158, Period 2021-2024, project value US\$700.000,00, and UBI funding US\$194.000,00.

ENMAT – E-mobility and sustainable materials and technologies. International Academic Partnership Programme announced by the National Agency for Academic Exchange (NAWA). Project period 1.12.2018 - 30.11.2020.

EcoSET - Ecology, Science, Education and Technology. International Academic Partnership Programme announced by the National Agency for Academic Exchange (NAWA). Project period 1.10.2018 - 30.11.2021.

PMAM (waste+CO<sub>2</sub>+mat) - Development of pilot production of building blocks obtained with industrial waste, carbon dioxide and non-potable water. Total funding: EUR 50.000,00.

### **Supervision of Doctoral Students (concluded):**

Pedro Silva Humbert on "Synthesis and characterisation of CO<sub>2</sub> activated binders and concretes using industrial wastes and precast buildings applications", Department of Civil Engineering and Architecture, UBI. January 2020.

Co-supervisor of the doctoral thesis of Pedro Romano on "Desenvolvimento de uma metodologia de avaliação da durabilidade de estruturas de betão armado", Department of Civil Engineering and Architecture, UBI. December 2019.

Supervisor of the doctoral thesis of Maria Manso de Castro Morão on "Designing a system of modular pieces for green surfaces using alkali-activated materials", Department of Civil Engineering and Architecture, UBI. January 2019.

Co-supervisor of the doctoral thesis of Isabel Cristina Castanheira e Silva, on "Development of geopolymeric artificial aggregates from mine waste mud for wastewater treatment systems", Department of Civil Engineering and Architecture, UBI, March 2013. Supervisor: Prof. António Albuquerque (DECA-University of Beira Interior).

Co-supervisor of the doctoral thesis of Jorge Manuel da Silva Carlos on "Passive systems for ventilation of buildings with pre-heating air", Department of Civil Engineering and Architecture, UBI, February 2010. Supervisor: Prof.a Helena Corvacho (FEUP - University of Porto).

Supervisor of the doctoral thesis of Fernando Manuel Alves Silva Pacheco Torgal, titled "Development of Alkali-activated binders obtained from Panasqueira waste mining mud", Department of Civil Engineering and Architecture, UBI, July 2007. Co-supervisor: Prof. Said Jalali (University of Minho).

Co-supervisor of the PhD thesis of João Carlos Gonçalves Lanzinha, titled "Rehabilitation of Buildings: Methods for Diagnosis and Intervention", Department of Civil Engineering and Architecture, UBI, November 2006. Supervisor Prof. Vasco Freitas (FEUP - University of Porto).

Co-supervisor of the PhD thesis of Luis Carlos Carvalho Pires, on "Experimental and Numerical Modelling of an Integrated Unit for Passive Cooling of Buildings", Department of Electromechanical Engineering, UBI, June 2011. Supervisor: Prof. Pedro Dinho Silva (DEM-University of Beira Interior).

Supervisor of the doctoral thesis of Marisa Sofia Dinis de Almeida, on "Characterization and formulation of warm mix recycled asphalt in central", Department of Civil Engineering and Architecture, UBI, July 2011. Co-supervisor: Profa. Maria de Lurdes Antunes (LNEC).

### **Supervision of Doctoral Students (ongoing):**

Dina Gabriela Robalo Barata Pinto on "Vegetation-growth and water-pervious carbon-cured construction materials", Department of Civil Engineering and Architecture, UBI, since September 2021.

Ana Isabel Almeida Coelho de Abreu on "Use of biomass and sewage sludge towards the production of eco-construction materials", Department of Civil Engineering and Architecture, UBI, since September 2021.

Luciana Sucupira Cristino on "Microstructure and thermal properties of cementitious materials with mining and metallic waste", Department of Civil Engineering and Architecture, UBI, since September 2019.

Erick Grünhäuser Soares on "Development of waste-based magnesium cement for CO<sub>2</sub> capture and storage", Department of Civil Engineering and Architecture, UBI, since September 2018.

Khalil El Azhar Beldjoudi on "Application of alkali-activated materials for improvement of soil and paving infrastructure properties", Department of Civil Engineering and Architecture, UBI, since September 2017.

Naim Sedira on "Novel waste-based alkali-activated binders by combining mining and quarrying wastes with other mineral and non-mineral waste", Department of Civil Engineering and Architecture, UBI, since February 2016.

Imed Beghoura on "Development of alkali-activated foamed materials combining both mining waste mud and expanded granulated cork", Department of Civil Engineering and Architecture, UBI, since February 2016.

Abdelhakim Benhamouda on "Rheology and processing waste-based alkali-activated binders obtained by combining mineral and non-mineral waste", Department of Civil Engineering and Architecture, UBI, since February 2016.

### **Awards and recognition:**

Winner idea within "Promove Regiões Fronteiriças/Promoting Border Regions" 2019 edition, supported by the La Caixa Foundation / BPI with the CO<sub>2</sub>LLECT project "selected idea". The awarded idea aims to develop a project for the installation of CO<sub>2</sub> collector filters directly in the chimneys of the industries (particularly, lime and biomass power plants) to collect carbon that can be reused to produce building materials, among other applications. The CO<sub>2</sub>LLECT project idea proposal was developed by Janine Ayoub and Mantas Sevelkovas, students of the Integrated Master in Architecture (University of Beira Interior), and co-developed by João Castro Gomes.

1st Prize awarded by TAKE-OFF Project – Building Global Technology Entrepreneurs for Advanced Materials given to DARKCO<sub>2</sub> business idea developed by João Castro Gomes. DARKCO<sub>2</sub> was chosen by the "HighTecMaterials Entrepreneurship Award, Pitch for Investors – International Financing Round", which was attended by 17 entrepreneurs, responsible for presenting 10 business ideas. The project aims to implement an industrial unit for the design, development, and testing of solutions and prototypes of pre-industrial products (based on the reuse of industrial waste and by-products, which harden with the absorption of carbon dioxide).

1st Prize Award CEBT Ibérico at Universidade da Beira Interior (2018). Award given to GEOGREEN testbed project developed by João Castro Gomes and Maria Manso. CEBT Ibérico is supported by INESPO III (Innovation Network Spain-Portugal).

1st Prize Climatelaunchpad Global Grand Final and Sustainable Production Systems theme Award Climatelaunchpad (2018). Awards given to eCO2blocks idea (best green business idea out of 135), developed by João Castro Gomes and Pedro Humbert, for building a business with the production of masonry blocks with 100% industrial waste-based materials, carbon dioxide and non-potable water. ClimateLaunchpad is the world's largest green business ideas competition, being part of part of the Entrepreneurship offerings of EIT Climate-KIC.

1st Prize Manuel António da Mota Foundation Award (2018). Awarded to UBI for eCO2blocks idea/project for developing a pilot production of building blocks obtained with industrial waste, without using potable water, which harden in 48 hours with high absorption of CO<sub>2</sub> (carbon dioxide). Research to support eCO2blocks idea was developed at University of Beira Interior, by João Castro Gomes and Pedro Humbert. The 9th edition of the Manuel António da Mota Award aimed to distinguish the Institutions that contributed with their projects to the Sustainable Development Objectives (ODS).

Top 10th best paper at the 4th international conference in Sustainable Construction Materials and Technologies, organized by University of Nevada- Las Vegas Coventry University (2016). Awarded to the paper entitled "Energy saving potential of cement-based mortar containing hybrid phase change materials applied in building envelopes" co-authored by M. Kheradmand, M. Azenha, J. Castro-Gomes, and J. Aguiar. The paper was judged by the SCMT4 awards committee to be an outstanding paper.

2nd best paper at the International Workshop on Environmental and Alternative Energy organized by NASA (2012). Awarded to Maria Manso and João Castro Gomes paper entitled "Modular system design for vegetated surfaces with alkaline activated materials", output of GEOGREEN Project – Waste geopolymeric binder-based natural vegetated panels for energy-efficient building, green roofs and facades. NASA Goddard Space Center. International Workshop on Environmental and Alternative Energy. December 4th to 7th in Maryland, USA.

**CV Internet sites:**

<https://scholar.google.pt/citations?user=rgS1HvUAAAAJ&hl=pt-PT>

<http://orcid.org/0000-0002-2694-5462>

<https://www.scopus.com/authid/detail.uri?authorId=14017800700>

<http://www.ubi.pt/Pessoa/jpcg>

C-MADE, Centre of Materials and Building Technologies: <http://cmadeubi.wordpress.com>