



Alicia Durán

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Education

Physics degree: University Nacional de Córdoba (Argentina), April 1974

PhD degree in Physics: Universidad Autónoma de Madrid, January 1984

Professional situation

Research Professor CSIC

Instituto de Cerámica y Vidrio (CSIC)

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Head of the GlaSS Research Group (ICV-CSIC)

President of the International Commission on Glass (ICG)

Guest Professor Wuhan University of Technology, China

Correspondent researcher CONICET, Argentina

Scientific adscription UNESCO: 3312.06 Material Technology. Glasses.

H-index WOK: 41

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Research interests

The general objectives are focused in the design, processing and characterisation of glasses, glass-ceramics and sol-gel materials, going from the structural features to properties (optical, mechanical, chemical, thermal, electrical, etc) and applications.

The concrete research objectives are regularly revised taking into account the trends in the glass world; especially the strategies to ensure glass industry continues to grow and thrive in solving uncertainty on many fronts: technical challenges; opportunities for

innovation; sources of energy; energy efficiency; emissions and environmental issues; and competitive products in new markets, all focused to build a sustainable society. Threats and challenges on one side and new opportunities for glass products and applications on the other have to be identified arising from glass science development and glass industry requirements.

Main threats and challenges are the increasing energy price levels; limited availability of several raw materials in the future & REACH obligations; alternative raw materials & new glass compositions; strict(er) legislations on emissions during glass production; (NO_x, metals, fine dust, CO₂). But also new opportunities arise, as new energy saving applications of glass, especially in buildings & automotive, glass in sustainable energy supply (e.g. photovoltaic systems, fuel cells, Li-batteries), bio-glasses, dental restoration, Solar glass, Photonics/OE, Add-on functionality, Solar Photocatalysis, Nanostructures materials (transparent GC for OE and photonics), as well as more efficient and focused R&D in the glass industry for breakthrough developments on energy saving, also attesting the suitability and safety of glass containers.

Most of these topics are currently developed in the group GlaSS, which research activity can be summarised in two methodological approaches:

. **Glasses and glass-ceramics produced by melting:** including tight sealing for MCFC and SOFC, low temperature sealing with high chemical resistance or phosphate and nitrated phosphate glasses for optics and solid electrolytes of Li-batteries. Controlled crystallisation processes and nanostructured transparent glass-ceramics for photonic applications are current key topics. On the other hand, modification of melting process for energy saving and lower emissions in glass furnaces are relevant goals for industry collaboration, also focused in the accreditation of food safety of glass containers.

Sol-gel materials for sustainable applications: including mesostructured coatings with applications in photocatalysis and solar cells, multifunctional coatings on glass (anti-scratch, hydrophobic/hydrophilic, reflective/AR, easy-to-clean, self-cleaning, etc). Protective anticorrosive and functional coatings on metals and alloys, corrosion protection of light alloys with corrosion inhibitors, bioactivation of metallic alloys for prosthesis are relevant issues, as well as inorganic and hybrid membranes for PEMFC. A key current topic is the development of transparent nano-glass-ceramics with high fluoride contents for photonic applications.

Memberships

President of the International Commission on Glass (ICG)

Steering Committee, Management Board (ICG)

TC07, TC16, TC23 and Editorial Board of ICG

Co-editor in chief of the International Journal on Applied Glass Science (IJAGS)

Editorial Board of Journal of Sol-gel Science and Technology

Editorial Board of European Journal of Glass Science and Technology

Selected publications

Glasses and glass-ceramics produced by melting

Sealing glasses for MCFC and SOFC

- L.D. Silva, A. M. Rodrigues, A.C.M. Rodrigues, M.J Pascual, A. Durán, A. A.Cabral. Sintering and crystallization of SrO-CaO-B₂O₃-SiO₂ glass-ceramic with different TiO₂ contents. *Journal of Non-crystalline solids* 473 (2017) 33–40, <http://dx.doi.org/10.1016/j.jnoncrysol.2017.07.021>.
- S. Rodriguez, V.A.C. Haanappel, A.Durán, F.Muñoz, G.C. Mather, M.J.Pascual, S.Gross. Glass-ceramics in the system MgO-BaO-B₂O₃-SiO₂ under simulated SOFC conditions. *International Journal of Hydrogen Energy* 41, 15335-15345 (2016). <http://dx.doi.org/10.1016/j.ijhydene.2016.07.051>)
- S. Rodríguez-López, R. Comesaña, J. del Val, A. Durán, V.M.Justo, F. C. Serbena, M. J. Pascual. Laser cladding of glass-ceramic sealants for SOFC. *Journal of the European Ceramic Society*, 53, 16, 4475-4484 (2015). <http://dx.doi.org/10.1016/j.jeurceramsoc.2015.08.009>
- A. Schusser, M.J. Pascual, A. Prange, A. Durán and R. Conradt. Characterization of a soldering system consisting of a glass from the system CaO-Al₂O₃-B₂O₃-SiO₂ and wollastonite. *Ceramics International* <http://dx.doi.org/10.1016/j.ceramint.2012.10.213>.
- C.Lara, M.J.Pascual, A.Durán. Chemical compatibility of RO-BaO-SiO₂ (R= Mg, Zn) glass-ceramics sealings with SOFC components. *Physics and Chemistry of Glasses: European Journal of Glass Science and Technology Part B*, 48, 4 (2007) 218-224.
- M.J.Pascual, C.Lara, A.Durán. Non-isothermal crystallization kinetics of devitrifying RO-BaO-SiO₂ (R= Mg, Zn) glasses. *Physics and Chemistry of Glasses: European Journal of Glass Science and Technology Part B*, 47, 5 (2006) 572-581.
- M. J. Pascual, V. V. Kharton, E. Tsipis, A. A. Yaremchenko, C. Lara, A. Durán, J. R. Frade. Transport properties of sealants for high-temperature electrochemical applications: RO-BaO-SiO₂ (R= Mg, Zn) glass-ceramics. *Journal of the European Ceramic Society*, 26 (2006) 3315-3324.
- C.Lara, M.J.Pascual, R.Keding, A.Durán. Electrical behaviour of glass-ceramics in the systems RO-BaO-SiO₂ (R= Mg, Zn) for sealing SOFC. *Journal of Power Sources*, 157 (2006) 377-384.
- M.J.Pascual, A. Durán, M.O. Prado, A new method for determining fixed viscosity points of glasses, *Phys.Chem Glasses* 46 (5) (2005) 512-520.
- C.Lara, M.J.Pascual, A.Durán. Glass-forming ability, sinterability and thermal properties in the systems RO-BaO-SiO₂ (R= Mg, Zn). *Journal of Non-Crystalline Solids*, 348 (2004) 149-155.
- C.Lara, M.J.Pascual, M.O.Prado, A.Durán. Sintering of glasses in the system RO-Al₂O₃-BaO-SiO₂ (R= Ca, Mg, Zn) studied by hot-stage microscopy. *Solid State Ionics*, 170 (2004) 201-208.
- M.J.Pascual, A. Durán, F.J. Valle, R. Berjoin, L.Pascual. Corrosion of borosilicate sealing glasses for molten carbonate fuel cells. *Journal of the American Ceramic Society*, 86, 11, 1918-1926 (2003).
- R.Keding, M.J.Pascual, L.Pascual, A.Durán, C.Rüssel. Corrosion mechanism of borosilicate sealing glasses in molten carbonates studied by impedance spectroscopy. *Journal of Electroanalytical Chemistry*, 528, 1-2, 184-189 (2002).
- M.J.Pascual, A. Durán, L.Pascual. Sintering behaviour of composite materials borosilicate glass-ZrO₂ fibre. *Journal of the European Ceramic Society* 22, 9-10, 1513-1524 (2002).
- M.J.Pascual, A.Durán, L.Pascual. Sintering process of glasses in the system Na₂O-B₂O₃-SiO₂. *Journal of Non-Crystalline Solids*, 306, 58-69 (2002).

M.J. Pascual, A. Durán, L. Pascual. Viscosity and thermal properties in the system $R_2O-B_2O_3-SiO_2$, R= Li, K, Na. *Physics and Chemistry of Glasses*, 43, 1, 25-31 (2002).

Phosphate and oxynitride phosphate glasses

N. Mascaraque, G. Tricot, A. Durán, F. Muñoz, Structural features of LiPON glasses determined by 1D and 2D 31P MAS NMR, *Int. J. App. Glass. Sci.* 7(1) (2016) 69-79.

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N. Mascaraque, A. Durán, F. Muñoz. Effect of alumina on the structure and properties of $Li_2O-B_2O_3-P_2O_5$ glasses, *Journal of Non-Crystalline Solids*, 357 (2011) 3212-3220. doi: 10.1016/j.jnoncrysol.2011.04.022.

F. Muñoz, L. Montagne, L. Pascual, A. Durán. Composition and structure effects on the properties of lithium borophosphate glasses showing boron anomaly, *Journal of Non-Crystalline Solids*, 355 (2009) 2571-2577.

F. Moreau, A. Durán, F. Muñoz, Structure and properties of high Li_2O -containing aluminophosphate glasses, *Journal European Ceramic Society*, 29 (2009) 1895-1902.

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F. Muñoz, L. Pascual, A. Durán, J. Rocherullé and R. Marchand, Oxidation behaviour of oxynitride phosphate glasses Li-Na-Pb-P-O-N, *Journal European Ceramic Society*, 26 (2006) 1455-1461.

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L. Pascual, A. Durán, Nitridation of glasses in the system $R_2O-MO-P_2O_5$. *Materials Research Bulletin*, 31(1996)1, 77-95.

Transparent nano glass-ceramics

A. Cabral, R. Balda, J. Fernández, G. Gorni, J.J. Velázquez, L. Pascual, A. Durán, M. J. Pascual. Phase evolution of KLaF₄ nanocrystals and its effects on the photoluminescence of Nd³⁺ doped transparent oxyfluoride glass-ceramics. *CrystEngComm*, 20, 5760-5771 (2018).

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G. Gorni, R. Balda, J. Fernández, L. Pascual, A. Durán, M.J. Pascual. Effect of the heat treatment on the spectroscopic properties of Er³⁺-Yb³⁺-doped transparent oxyfluoride nano-glass-ceramics. *Journal of Luminescence*, 193 (2018) 51-60, <http://doi.org/10.1016/j.jlumin.2017.05.063>

G. Gorni, R. Balda, J. Fernández, I. Iparraguirre, J.J. Velázquez, Y. Castro, L. Pascual, G. Chen, M. Sundararajan, M.J. Pascual*, A. Durán. Oxyfluoride glass-ceramic fibers doped with Nd³⁺: structural and optical characterization. *CrystalEngComm* 19 (2017) 6620–6629. DOI: [10.1039/C7CE01380A](https://doi.org/10.1039/C7CE01380A)

A.de Pablos-Martín, D. Ristic, A.Durán, M.Ferrari, M.J Pascual. Synthesis and characterization of Tm³⁺/Yb³⁺- co-doped KLaF₄ glass-ceramics. *CrystalEngComm* 19, 967-974 (2017). Doi: [10.1039/c6ce01845a](https://doi.org/10.1039/c6ce01845a).

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A. de Pablos-Martín, J. Méndez-Ramos, J. del-Castillo, A. Durán, V. Rodríguez, M.J. Pascual. Crystallisation kinetics and luminescence properties of Er³⁺/Yb³⁺-doped NaYF₄ nano-glass-ceramics. *Journal of the European Ceramic Society*, 35, 6 (2015) 1831-1840. <http://dx.doi.org/10.1016/j.jeurceramsoc.2014.12.034>.

A.de Pablos-Martín, M.J.Pascual, A.Durán. Transparent nano-glass-ceramic for photonic applications. Distribution of RE-doping elements in the fluoride nano-crystals analysed by XAS and HR-TEM. *Advances in Science and Technology* 20, 111-120 (2014).

A. de Pablos-Martín, M.A.García, A. Muñoz, G.Castro, M.J.Pascual, A.Durán. Analysis of the distribution of Tm^{3+} ions in LaF_3 containing glass-ceramics through X-Ray Absorption Spectroscopy. *Journal of Non-Crystalline Solids* 384, 83-87 (2014). (<http://dx.doi.org/10.1016/j.jnoncrysol.2013.07.021>).

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A.de Pablos-Martín, C. Patzig, T. Höche, A. Durán, M.J. Pascual, Distribution of Thulium in Tm^{3+} -Doped Oxyfluoride Glasses and Glass-Ceramics, *Cryst.Eng.Comm* 15 (2013) 6979-6985. [DOI: 10.1039/C3CE40731D](https://doi.org/10.1039/C3CE40731D)

A.de Pablos-Martín, D. Ristic, S.Bhattacharyya, Th. Höche, G. Mather, M.Ramírez, S.Soria, M. Ferrari, G.C. Righini, L.Bausá, A. Durán, M.J. Pascual. Effect of the addition of Tm^{3+} on the crystallisation of LaF_3 nanocrystals in oxyfluoride glasses. Optical characterisation and Up-conversion. *Journal of the American Ceramic Society* 96 [2] 447–457 (2013) [DOI: 10.1111/jace.12120](https://doi.org/10.1111/jace.12120)

R.Wurth, M.J.Pascual, G.C.Mather, A. de Pablos-Martín, F.Muñoz, A.Durán, G.Cuello, C.Rüssel. Crystallisation mechanism of a multicomponent lithium alumino-silicate glass. *Journal of Materials Chemistry and Physics* 134 1001-1006 (2012).

A. de Pablos-Martín, A.Durán, M.J.Pascual. Nanocrystallisation in oxyfluoride systems. Mechanisms of crystallization and photonic properties (paper review). *International Materials Review* 57 [3] (2012) 165-186.

A. de Pablos-Martín, N. Hémono, S.Bhattacharyya, T. Höche, G. C. Mather, J.Deubener, H.Bornhöft, F. Muñoz, A. Durán, M. J. Pascual. *Crystallisation kinetics of LaF_3 nanocrystals in an oxyfluoride glass*. *Journal of the American Ceramic Society* 94 [8] (2011), 2420-2428.

F.Muñoz, A.de Pablos-Martín, N.Hémono, M.J.Pascual, A.Durán, L.Delevoye, L. Montagne. *On the structural evolution of nano-crystalline LaF_3 and $NaLaF_4$ phases in aluminosilicate glasses*. *Journal of Non-Crystalline Solids*, 35 (2011) 1463-1468.

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Sol-gel materials for sustainable applications

Anticorrosive and functional coatings on metals and alloys

U. Tiringer; A. Durán; Y. Castro; I. Milosev. Self-Healing Effect of Hybrid Sol-Gel Coatings Based on GPTMS, TEOS, SiO₂ Nanoparticles and Ce(NO₃)₃ Applied on Aluminum Alloy 7075-T6. *Journal Electrochemical Society*, 165 - 5, (2018) C213 - C225. 2018.

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L. Paussa, F. Andreatta, N.C. Rosero Navarro, A. Durán, L. Fedrizzi. Study of the effect of cerium nitrate on AA2024-T3 by means of electrochemical micro-cell technique. *Electrochimica Acta*, 70 (2012) 25-33

L. Paussa, N.C. Rosero Navarro, D. Bravin, F. Andreatta, A. Lanzutti, Y. Castro, M. Aparicio, A. Durán, L.Fedrizzi. ZrO₂ sol-gel pre-treatments doped with cerium nitrate for the corrosion protection of AA6060. *Progress in Organic Coatings* 74 (2012) 2, 311-319.

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AWARDS

1973. University Prize. Special mention Diploma. Universidad Nacional de Córdoba (Argentina).

1988. International Commission on Glass (ICG) Vittorio Gottardi Award 1988 for Young Researchers in the field of glass science and technology.

2014. Award RAICES (ROOTS) to the International Cooperation in Science and Technology, conceded by the Ministry of Science, Technology and Innovation of Argentina.