Curriculum vitae

PERSONAL INFORMATION

Family name, First name: Bonduelle, Colin
ORCID identifier: 0000-0002-7213-7861
Date of birth: 25/02/1980
Nationality: French
URL for web site: https://www.lcpo.fr/people/faculties/colin-bonduelle
Google Scholar profile URL: https://scholar.google.com/citations?user=BLAI3ooAAAAJ&hl=en
WebOfScience: https://www.webofscience.com/wos/author/record/1461213

EDUCATION

2018 *Habilitation thesis* (HDR) of the University of Toulouse (defended publicly on 16/11/2018).
2009 *PhD* in Molecular Chemistry, University of Toulouse, France.
2005 *Masters* in Biochemistry and Chemical Biology, University of Toulouse, France.

CURRENT POSITION

2019-present *CNRS researcher* and *leader of the PolyPepTeam* (Protein-like polymers, NCA chemistry and ring-opening polymerization, 5 PhDs, 2 post-docs) in the *Polymer and Self-assembly* Team at Lab. Organic Polymer Chemistry (LCPO), CNRS, Pessac, France.

PREVIOUS POSITIONS

2014-2018 *CNRS researcher* at Lab. Coordination Chemistry (LCC), CNRS, Toulouse, France.
Topic: Secondary structures of macromolecular peptidomimetics
2011-2014 *Post-doctoral fellow* at LCPO, University of Bordeaux, Pessac, France.
Topic: Nanomaterials through glycopolymers self-assembly
2009-2011 *Post-doctoral fellow* at Dept. of Chemistry, University of Western Ontario, Canada.
Topic: Macromolecular grafting and biomaterials
2005-2009 *Grad. student* at Lab. Fundamental and Applied Heterochemistry (Supervision of Dr. Didier Bourissou), University of Toulouse, France.
Topic: Oxygenated heterocycles: synthesis and reactivity.

SIGNIFICANT FELLOWSHIPS GRANTS AND AWARDS

2021 **Cadre à Haut Potentiel** CNRS
2020-present **Young Habilitant Grant recipient**: Sequence-controlled polypeptide copolymers, 120 kE.
2020-present **Young researchers grant (French ANR)** "Ring-Opening Polymerization-Induced Self-Assembly", ROPISA, 210 kE.
2017 **Patent issued award**, 2017 Vanguard Awards Winners, Worlddiscoveries, London, ON, Canada.

Other grants (all as PI):

- RRI "Frontiers of Life" (2022-2025): *PhD fellowship* on lipopolypeptide design.
- ANR Plan de relance (2022-2024): *Post-doc fellowship* on biosourced polypeptide chemistry (24 months, 245 k€).
- CSC grant (2022-2026): *Chinese PhD fellowship* on electro active polypeptide polymers.
- AST grant (technology transfer): *Development Engineer* (18 months) on antimicrobial polypeptoid polymers (2022-2023, 390 k€).
- CSC grant (2021-2025): *Chinese PhD fellowship* on photo-active polypeptide polymers.
- UBx then AST grant (technology transfer): *Development Engineer* (6 + 18 months) on ROPISA (2020, 60 k€, 2021, 180 k€).
- CNRS MITI funding: *Running costs* (2020-2022, polypeptide-based nanocomposites, 30 k€).
- ECOS funding (UNAM- University of Bordeaux, 2020-2023): *Travel exchanges with Mexico* to support the project POLYMERZYME (enzyme like catalysis with polypeptides, about 20 k€).
- Conacyt grant (2017-2021): *Mexican PhD fellowship* on antimicrobial polypeptoid polymers.
- Occitanie Region research funding: 1) *PhD fellowship* on "Self-assembly by coordination of peptidic homopolymers" (2017, 120 k€). 2) *Post-doc fellowship* on "metal induced structuring of polypeptide" (2016, 60 k€).

SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

Postdocs

2022-2024 J. Aujard-Catot, post-doc on biosourced polypeptide developments (technology transfer)
2022-2023 A. Tronnet, post-doc on antimicrobial polymer design (technology transfer)

2021-2022 S. Antoine, post-doc now Emulseo company's sales manager in Pessac.
2020 B. Bizet, post-doc now R&D project leader Bioadhesive Ophtalmics, Paris, France.
2016 M. NGuyen, post-doc now research engineer at Lab. LCC, Toulouse, France.
2015 E. Piedra-Arroni, post-doc now teaching assistant.

PhD students (8 HDR supervision)

2022-present Rosanna Le Scouarnec, PhD since October 2022
2022-present Yupei Ma, PhD since October 2022
2021-present H. Beauseroy, PhD student since October 2021
2021-present S. Ji, PhD student since March 2021
2020-present M. Badreldin, PhD student since October 2020
2018-present A. Tronnet, PhD student, now post doc in LCPO.
2017-2021 P. Salas-Ambrosio, PhD student, now post doc in UCLA.
2017-2020 G. Manai, PhD student, now data engineer in Paris.

MSc students

2014-present **13 Masters students**: 6 at LCC, Toulouse, France and 7 at LCPO, Pessac, France.

TEACHING ACTIVITIES

2022 + 2023 **6h/year in Sustainable polymer chemistry.** University of Perpignan: Master 2 course.
2020 **2 h: Sustainable polymer chemistry**. Summer School, Bordeaux INP (M2 level).
2015-2018 **6h/year in Pharmacy**. Faculty of Pharmacy of Toulouse: Master 1 course "initiation to peptide synthesis"
2006-2008 **64h/year in Chemistry**. University of Toulouse: Licence and Master practical lab classes.

ORGANISATION OF SCIENTIFIC MEETINGS

2019-present **Organizer** (seminar officer) of internal seminars at LCPO (every weeks). This includes invited external seminars (8 foreign scientific leaders/year)
2018 **Organizing committed**: GFP National Meeting (Polymer sciences), November 2018, Toulouse and November 2023, Bordeaux, France. BPC International Meeting (Polymer sciences), June 2022, Bordeaux, France. ACS Symposium “Polymers and Biology”, ACS Spring 2023 in Indianapolis, USA.
2011-present **Participation in the organization of scientific days** (LCPO and LCC): IUPAC consortium (2011-2013), chemistry-biology days (Toulouse doctoral school, 2015-2017), Bordeaux doctoral school days (2020) etc.

INSTITUTIONAL RESPONSIBILITIES

2021 **Promotion CHP** CNRS 2021
2021-present **Member** of the LCPO laboratory Council, Pessac, France (2021), **member** of the equipment committee (2022)
2021-present **Strategic Organizing Committee** member of the Bordeaux Imaging Center
2021, 2023 Member, **BQR funding committee**, University of Perpignan, France
2018-present 5 **PhD defense committees** including one at the University of Birmingham (UK) and one at the RCSI (Dublin)
2015-2018 **Elected member** of the LCC laboratory Council, Toulouse, France.

COMMISSIONS OF TRUST (amount of evaluation)

2020 **Expert evaluator** for the Academy of Sciences of the Czech Republic (scientific evaluation of research career, 15)
2014-2022 **Grant evaluator**: national research agency (ANR, 5; ANRT, 1; Chaire Industrielle, 1), CONACYT, research agency in Mexico (5). COFECUB international council (1), MSC-IF call (H2020, Horizon) (6).

PEER REVIEW

2014-present **Reviewer for**: Nat. Commun., Angew. Chem., Biomacromolecules etc… more than 140 verified reviews on publons

OUTREACH AND POPULARIZATION

- My research developed with the PolyPepTeam has been highlighted by the CNRS (Institute of Chemistry and in French) through 4 recent press releases (https://www.inc.cnrs.fr/fr/cnrsinfo/une-synthese-et-un-auto-assemblage-verts-pour-les-polypeptides, https://inc.cnrs.fr/fr/cnrsinfo/un-nouveau-concept-de-fabrication-de-nano-materiaux-hybrides-par-auto-assemblage, https://inc.cnrs.fr/fr/cnrsinfo/des-polymeres-cycliques-contre-les-infections-clostridioides-difficile and https://www.inc.cnrs.fr/fr/cnrsinfo/un-effet-memoire-exceptionnel-dans-des-gels-polymeres-

thermosensibles-base-de-proline).

- I also took an active part in popularization actions (fête de la sciences, olympiades de la chimie etc...) by getting involved, in particular, with the chemistry and society association (caravane de la chimie, 2018).

MEMBERSHIPS OF SCIENTIFIC SOCIETIES

2023 Member of the emerging action IEA P2NanoBio with Mexico (CNRS/UNAM)
2018-2021 Partner Member of the international laboratory LCMMC (Scientific exchanges and collaborative efforts France/Mexico).
2014-present ACS, GFP (Groupe Français des Polymères) and GFPP (Groupe Français des Peptides et Protéines) membership.

MAJOR COLLABORATIONS

- B. Dupuy, Polypeptoid polymers against C. difficile infections (Institut Pasteur, Paris).
- J.L. Stigliani, Secondary structure of polypeptide through molecular modelling (LCC, CNRS, Toulouse).
- Simon Tricard, Polypeptide-based nanocomposites (LPCNO, CNRS, Toulouse).
- Marcela Ayala, Artificial metalloenzymes through ring-opening polymerization (Instituto de Biotecnologia, UNAM, Cuernavaca, Mexico).

CAREER BREAKS

2016/2017 - Parental leave taken for my daughter (4 months)

SUMMARY

Peer reviewed articles:	52 (16* as corresponding author)
Selected journals:	Nature Communication (1*), J. Am. Chem. Soc. (2, 1*), Angew. Chem. Int. Ed. (2*), Chem. Commun. (5, 2*), Biomacromolecules (7, 2*), Polymer Chemistry (6, 5*).
Citations (31/12/2022)**:**	2175 (GS, 1116 since 2018); 1827 (WoS)
h-index (31/12/2022)**:**	23 (GS, 16, since 2018); 21 (WoS)
i10-index (31/12/2022):	38 (GS, 29, since 2018);
Patents:	4 granted, 2 applications
Invited lectures:	12 (10 international including 1 keynote)
Contributed lectures:	17 (9 international mainly ACS (8))
Seminars and worshops:	21 (12 international mainly in Mexico (11))

Early achievements track-record

RESEARCH ACHIEVEMENTS SUMMARY.

I am biochemist by training and I did my PhD thesis in polymer chemistry to become an expert in ring-opening polymerization, a polymerization process that I have deeply studied experimentally (*Chem. Commun. 2008, Biomacromolecules 2009, Chem. Eur. J. 2013*) and by theoretical DFT methods (*Chem. Eur. J. 2008*). In order to combine this expertise with new skills in biomaterials development, I decided to move to Canada to join the Western University. As a postdoctoral associate in the Gillies lab, I developed unique elastomeric rubber with antifouling properties (*2 patents WO, Macromolecules 2010, Macromolecules 2011, ACS AMI 2011*). I also designed dendritic analogues of cell penetrating peptides and simple synthetic methods to graft them onto nanomaterials (*Pharmaceuticals 2010, J. Polym. Sci. 2011, J. Matter Chem. 2012, Soft Mat. 2012*). In a second postdoc position, I used all this experience to develop nanomaterials based on polypeptides (*Polymer self-assembly group at LCPO/CNRS, JACS 2012, Chem. Commun. 2012*). Combined to polysaccharides, I designed glycoprotein-like multivalency by polypeptide self-assembly (*Farad. Disc. 2013, Chem. Commun. 2014, Chem. Commun. 2016*).

I then joined in 2014 the "medicinal chemistry and biomimetic oxidations" group at LCC/CNRS, which specializes in bioinorganic chemistry and infectology. I developped new methodologies to synthesize N-carboxyanhydride (NCA) monomers and to perform their ring-opening polymerization. For instance, I developed unique polymers mimicking metalloproteins and nucleoproteins by using reversible interactions based on coordination chemistry or on DNA binding (*Chem. Commun. 2017, Polym. Chem. 2017 and 2018, Biomacromolecules 2018*). Such polypeptides are currently used to prepare new classes of bioinspired piezoelectric nanocomposites (*Nat. Commun. 2020*) or DNA-responsive nanomaterials (*Polymers 2020, Biomacromolecules 2022*).

After my Habilitation thesis (November 2018), I have decided to move back from Toulouse to Bordeaux to set up my own team (PolyPepTeam) to better develop breakthrough methodologies using ring-opening polymerization of N-carboxyanhydride at LCPO. Thanks to a unique collaboration with the Pasteur Institute, I have for instance achieved ring-expansion methodologies to mimick antimicrobial peptides (*Biomacromolecules 2021, JACS 2021, Patent 2022 WO2022175319A1*). Other main achievements include the development of aqueous ring-opening polymerization induced self-assembly processes (ROPISA, *Angew. Chem. Int. Ed. 2020, VIP Paper, Patent 2021 WO2021/043865*) or the use of aqueous ring-opening polymerization towards protein-like polymers with thermoresponsive properties (*Angew. Chem. Int. Ed. 2022, Hot Paper, Patent 2022* EP22306210.0).

Overall, my research developments have already resulted in patents and publications in major journals related to chemical sciences (JACS, Angewandte, Nature Communication...). *My in-depth expertise in NCA chemistry as well as the new tools I developped recently in ring-opening polymerization is an excellent platform to conceive the polymers for tomorrow's application following bioinspired and biomimectic polymer design.*

REPRESENTATIVE PUBLICATIONS

To date I have published 52 papers in peer-review journals (29 since my CNRS position, 17 corresponding author).

5 selected publications *(all corresponding or joint corresponding author – see *):*

1. "Memory effect in thermoresponsive proline-based polymers" M. Badreldin, R. Le Scouarnec, S. Lecommandoux, S. Harrisson,* C. Bonduelle* *Angew. Chem. Int. Ed.* **2022**, 61, 46, e202209530
Hot Paper featured on the Back Cover.
2. "Cyclic poly(α-peptoid)s by lithium bis(trimethylsilyl)amide (LiHMDS)-mediated ring-expansion polymerization: simple access to bioactive backbones" P. Salas-Ambrosio, A. Tronnet, M. Since, S. Bourgeade-Delmas, J.L. Stigliani, A. Vax, S. Lecommandoux, B. Dupuy, P. Verhaeghe,* C. Bonduelle* *J. Am. Chem. Soc.* **2021**, 143, 3697.
Featured on the Cover.
3. "Bidimensional lamellar assembly by coordination of peptidic homopolymers to platinum nanoparticles" G. Manai, H. Houimel, M. Rigoulet, A. Gillet, P.F. Fazzini, A. Ibarra, S. Balor, P. Roblin, J. Esvan, Y. Coppel, B. Chaudret, C. Bonduelle, * S. Tricard* *Nature Commun.* **2020**, 11, 2051.
Editors' highlight: https://www.nature.com/collections/wdzvyhgxft/content/johannes-kreutzer)
4. "Aqueous ring-opening polymerization induced self-assembly (ROPISA) of *N*-carboxyanhydrides" C. Grazon, P. Salas-Ambrosio, E. Ibarboure, A. Buol, E. Garanger, M. Grinstaff, S. Lecommandoux,* C. Bonduelle* *Angew. Chem. Int. Ed.* **2020**, 59, 622.
VIP Paper featured on the Cover.

5. “Secondary structures of synthetic polypeptide polymers” C. Bonduelle* *Polym. Chem.* **2018**, 9, 1517. *Contribution to the emerging investigator issue 2018.*

PATENTS (4 as main inventor)

1. “Pharmaceutical composition” C. Bonduelle, S. Lecommandoux, S. Curia Patent application EP22305852.0 (MedinCell).
2. “Synthetic polymers and copolymers with hysteresis properties” C. Bonduelle, S. Harrisson, S. Lecommandoux, M. Badreldin, R. Le Scouarnec Patent application EP22306210.0 (AST).
3. "Antimicrobial cationic peptoid and N-substituted peptidic copolymers, preparation and uses thereof" C. Bonduelle, P. Verhaeghe, B. Dupuy, P. Salas-Ambrosio, A. Tronnet, Patent granted WO2022175319A1.
4. "Method for preparing controlled peptide-based copolymers in an aqueous solution" C. Bonduelle, S. Lecommandoux, E. Garanger, C. Grazon Patent granted, WO2021043865.
5. "Methods for preparation of novel graft copolymers" E. Gilles , C. Bonduelle, G. Stojcevic, Patent granted WO2012019302.
6. "Functionalized copolymers of isoolefins and diolefins and their use as compatibilizers" E. Gillies , C. Bonduelle, G. Stojcevic, Patent granted WO2012019303.

INVITED PRESENTATIONS

‘Invited/Keynote Lectures at major Conferences and Symposia’.

1. *“From Thermoresponsive Proteins to Polymer Chemistry*" Invited speaker at the 14th Advanced Polymers via Macromolecular Engineering, APME23, Paris, France (April 23-27, **2023**).
2. *“Polypeptides: from proteins to new approaches in polymer synthesis*" Invited speaker at the International Conference on Polymers and Advanced Materials, POLYMAT 2022, Huatulco, Mexico (October 16-21, **2022**).
3. "*Polypeptides from novel approaches to unconventional self-assembly"* Keynote speaker at the Milan Polymer Days (MIPOL 2022) Milan, Italy (June 19-21, **2022**).
4. "*Aqueous ring-opening polymerization induced self-assembly"* Invited speaker at the Organic and Hybrid Materials symposia in the session “Polymers and nanopolymers: chemistry, characterization and applications symposium”, IMRC (MRS) | XXIX 2022, Hybrid Conference, Mexico (August 14-19, **2021**).
5. "*Polypeptides from novel approaches in polymer chemistry"* Invited speaker at the “Joint Meeting on Peptides and Proteins GFPP22 & BPGM5: Peptides and proteins without frontiers” Port-Leucate, France (May 29 – June 3, **2022**).
6. "*From proteins to polymer chemistry"* Invited speaker at the “17th scientific and industrial days of the French Group of Polymers (GFP, Mediterranean section). Marseille, France (April 7 – 8, **2022**).
7. "*Cyclic poly(peptoids) as promising antimicrobial agents"* Invited speaker at the Polymers and nanopolymers: chemistry, characterization and applications symposium, IMRC (MRS) | XXIX 2021, Online Conference, Cancun, Mexico (August 16-18, **2021**).
8. "*Amphiphilic polypeptides through aqueous ROPISA process"* Invited speaker at the Soft Materials in Nanomedecine symposium, IUPAC | CCCE 2021, the 48th World Chemistry Congress and 104th Canadian Chemistry Conference and Exhibition, Online Conference, Canada (August 13-14, **2021**).
9. "*Ring-Opening Polymerization-Induced Self-Assembly of N-carboxyanhydrides"* Invited speaker at the Bio-inspired Macromolecular Materials symposium (PMSE), ACS Spring 2021 National Meeting (virtual), Online Conference, USA (April 5-8, **2021**).
10. "*Synthetic polypeptides polymers: secondary structures and self-assembly*" Invited speaker at the International Conference on Polymers and Advanced Materials, POLYMAT 2019, Huatulco, Mexico (October 20-25, **2019**).
11. *"Synthetic polypeptides as simplified analogues of conjugated proteins"* Invited speaker at the 8th International Symposium on Polymer Chemistry, PC2018, Changchun, China (June 6-9, **2018**).
12. "*Synthetic polypeptides as biomimetic analogues of natural proteins*" Invited speaker (Plenary session) at the JEPO congress of 2016, Piriac sur Mer, France (September 19-22, **2016**).