Dr. Alessandro Butté

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PERSONAL DATA

- Place and Date of Birth: Milano (Italy) – July 14th, 1972
- Sex: Male
- Nationality: Italian (Swiss residence permission C)
- Marital Status: Married (two children)

CURRENT EMPLOYMENT

- Employer: ETH Zurich – CH-8093 Zürich – Switzerland
- Position: Senior researcher
- Work Phone: +41 (44) 633 38 98
- Work Email: alessandro.butte@chem.ethz.ch
- Work Web Page: www.morbidelli-group.ethz.ch

PREVIOUS EDUCATION & WORKING EXPERIENCES

- 2011/13: Project Manager at Lonza AG (Visp, CH)
- 2010/12: Share best practice leader DSP technologies at Lonza AG (Visp, CH)
- 2008/10: Group leader in DSP technologies at Lonza AG (Visp, CH)
- 2003/08: Habilitation (senior researcher) at the Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, in the group of Prof. M. Morbidelli.
- 2001/03: Post-doctoral fellow at the Georgia Institute of Technology, Atlanta, GA, USA, in the group of Prof. J.F. Schork.
- 2000/01: Post-doctoral fellow at the Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, in the group of Prof. M. Morbidelli.
- 1996/00: Ph.D. student at the Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, in the group of Prof. M. Morbidelli.
- 1991/96: Student in Chemical Engineering at the Politecnico di Milano, Milan, Italy. Final mark: 100/100 *cum laude*. Diploma work done with Prof. S. Carrá.

Alessandro Butté – Ursprungstrasse 2 – CH-8044 Zürich
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PROFESSIONAL SKILLS

- Strategy and marketing, finance and controlling.
- Project management: coordination of R&D chemists, production, QC and QA, sales and clients. Experience in management of Phase I, II, III, commercial and generic processes.
- Share-Best-Practice leadership for downstream technologies in Lonza Visp:
  - training of all R&D chemists in DSP (organization of seminars and workshops)
  - first contact for all inquiries on DSP operations and coordination of proposal activities
  - introduction of lean / 6-sigma operations in R&D and production
  - communication activities (customer visits, conferences)
- Introduction and implementation of Quality-by-Design in up- and down-stream processes
- Process development for the purification and isolation of small molecules, peptides and conjugates
  - DSP process development and optimization for Phase III and commercial APIs
  - Development of second generation processes for generic APIs
  - Development of new downstream processes for Phase I and II products
- Costing, preparation and planning of Phase I to III APIs production under ISO or GMP conditions
- Management of academic collaborations in DSP

RESEARCH SKILLS & EXPERTISE

- Development, modeling and optimization of (living) free radical polymerizations (bulk, suspension, emulsion). Reactive polymer gelation for production of highly porous materials.
- Development, modeling and optimization of purification processes by liquid chromatography and membrane separations of small molecules, peptides, protein and monoclonal antibodies. Experience in the development of continuous and semi-continuous purification processes.
- Use of Quality by Design in process development and qualification of APIs. Use of quality risk management tools for project management. Use of 6-Sigma and Lean tools for both project development and management.
- Large scale purifications under GMP conditions and process validation. Production preparation (Risk analysis, GMP documentation), costing, planning, support (DRs/CRs, release) and reporting.
- Purification of highly active APIs (OEL < 100 ng/m^3).

ATTENDED COURSES

- 2013: International Junior Management Program at St. Galler Business School (CH)
- 09/2012: Customer focus. Lonza internal course.
- 02/2012: Late Stage Development and Commercialization of APIs: Managing Risk and Quality in the Pharmaceutical Industry. Organized by World Trade Group (London, UK).
- 01/2012: Six Sigma Green belt course. Lonza internal course.
- 04/2009: Team leadership. Lonza internal course.
- 08/1997: "Advances in emulsion polymerization and latex technology" in Davos (Switzerland) by the Emulsion Polymers Institute, Lehigh University, Bethlehem PA.

- 09/1996: Intensive course on computational chemistry at the University Ramon Lull, Barcelona, Spain (best final ranking).

AWARDS

- 06/2002: ETH Zurich medal for outstanding Ph.D. thesis.

TEACHING ACTIVITIES

- 2004/08: Lecturer of "Numerical and Statistical Methods for Chemical Engineers" at ETH Zurich
  - Matrix operations, (non-)linear algebraic systems, (partial-) differential equation
  - Design of experiments: factorial design and surface response models

LANGUAGES

- Italian: Mother tongue.
- English: Fluent, both oral and written.
- German: Good knowledge.

HOBBIES

- Climbing, photography, ski-touring, hiking, traveling.

REFERENCES

- Prof. Dr. Massimo Morbidelli, ETH Zürich, Zürich, Switzerland – Email: morbidelli@chem.ethz.ch
- Dr. Stéphane Varray, Lonza AG, Visp, Switzerland – Email: stephane.varray@lonza.com
- Dr. Michael Schulte - Merck KGaA, Darmstadt, Germany – Email: Michael.M.Schulte@merckgroup.com

INDUSTRIAL & ACADEMIC COLLABORATIONS

- 2009/12: Nemopur project (7th Framework EU Program / Marie Curie Project) on nanofiltration and molecular imprinting processes for the separation of genotoxic impurities.
- 2009/12: Collaboration with the University of Reims (France) on the development of continuous partition chromatography (CPC) for peptide purifications.
- 2008/11: Collaboration with ETH Zurich (CH) on model driven qualification of peptide purifications by quality by design.
- 2008/09: Consultant for DSP of Merck-Serono AG (Vevey, CH).
- 2006/07: Collaboration with Lonza AG (Visp, CH) on the optimization of peptide purification.
- 2005/06: Collaboration with Novartis AG (Basel, CH) on the modeling of ion-exchange chromatography of antibody variants.

- 2004/08: Advanced Interactive Materials by Design (AIMs) integrated project (6th Framework EU Program) on the modeling and characterization of new chromatographic supports for antibody purification (project scientific coordinator).
- 2001/03: Development of a numerical model aimed to the control of the acetylation process of cellulose acetate in collaboration with Celanese Acetate (Charlotte, NC, USA).
- 1998/00: Collaboration with Ausimont S.p.a. (Italy) for the development of microemulsion polymerizations of the PTFE.
- 1996: Collaboration with Pirelli Cavi S.p.a. (Italy) on TiO_2 aerosol production.

PAPERS

1. A. Butté, A. Ghielmi, G. Storti, M. Morbidelli, "Calculation of molecular weight distributions in free-radical polymerization with chain branching", *Macromol. Theory Simul.*,**8**, 498 (1999).
2. A. Butté, G. Storti, M. Morbidelli, "Kinetics of living free radical polymerization", *Chem. Eng. Sci.*, **54**, 3225 (1999).
3. S. Forcolin, A.M. Marconi, A. Ghielmi, A. Butté, G. Storti, M. Morbidelli, "Coagulation phenomena in emulsion polymerization of vinyl chloride", *Plastics, Rubber & Composites*, **28**, 109 (1999).
4. A. Butté, G. Storti, M. Morbidelli, "Miniemulsion Living Free Radical Polymerization of Styrene", *Macromolecules*, **33**, 3485 (2000).
5. A. Butté, G. Storti, M. Morbidelli, "Miniemulsion Living Free Radical Polymerization by RAFT", *Macromolecules*, **34**, 5885 (2001).
6. A. Butté, G. Storti, M. Morbidelli, "Evaluation of the chain length distribution in free-radical polymerization. 1. Bulk Polymerization", *Macromol. Theory Simul.*,**11**, 22 (2002).
7. A. Butté, G. Storti, M. Morbidelli, "Evaluation of the chain length distribution in free-radical polymerization. 2. Emulsion Polymerization", *Macromol. Theory Simul.*,**11**, 37 (2002).
8. A. Butté, G. Storti, M. Morbidelli, "Emulsion Polymerization: Radical Segregation and Its Role in Controlled Polymerization", *Macromol. Symp.*,**182**, 181 (2002).
9. A.D. Peklak, A. Butté, G. Storti, M. Morbidelli, "A Discretization Method for Computing Chain Length Distribution", *Macromol. Symp.*,**206**, 481 (2004).
10. F.J.Schork, Y.W. Luo, W. Smulders, J.P. Russum, A.Butté, K. Fontenot, "Miniemulsion Polymerization", *Adv. Polym. Sci.*,**175**, 129 (2005).
11. N. Marti, F. Quattrini, A. Butté, G. Storti and M. Morbidelli, "Production of Polymeric Materials with Controlled Pore Structure: the Reactive Gelation Process", *Macromol. Mat. Eng.*, **290**, 221 (2005).
12. A.D. Peklak, A. Butté, G. Storti, M. Morbidelli, **"**Gel effect in the bulk reversible addition-fragmentation chain transfer polymerization of methyl methacrylate: Modeling and experiments", *J. Polym. Sci. A: Polym. Chem.*, **44**, 1071 (2006)
13. A. Butté, A.D. Peklak, "Parametric Analysis of the Intermediate Concentration in a RAFT polymerization and its Influence upon the Polymerization Kinetics", *Macromol. Theory Simul.,***15**, 285 (2006).
14. A. Dubey, M.J. Realff, J.H. Lee, F.J. Schork, A. Butté, B. Ollé, L.E. Kizer, "Modeling and Inferential Control of the Batch Acetylation of Cellulose", *AIChE J.*, **52**, 2149 (2006).
15. A.D. Peklak, A. Butté, "Modeling of Diffusion Limitations in Bulk RAFT Polymerization", *Macromol. Theory Simul.,***15***,* 546 (2006).

16. B. Apostolovic, F. Quattrini, A. Butté, G. Storti and M. Morbidelli, "Ab-initio Emulsion Polymerization by RAFT through the Addition of Cyclodextrins", *Helv. Chim. Acta*, **89**, 1641 (2006).
17. A.D. Peklak, A. Butté, **"**A kinetic model of RAFT polymerization of styrene in seeded emulsion", *J. Polym. Sci. A: Polym. Chem.*, **44**, 6114 (2006).
18. V. Mittal, N.B. Matsko, A. Butté, M. Morbidelli, "Functionalized polystyrene latex particles as substrates for ATRP: Surface and colloidal characterization", *Polymer*, **48**, 2806 (2007).
19. A. Butté, G. Storti, M. Morbidelli, "Microgel Formation in Emulsion Polymerization", *Macromol. Theory Simul.,***16**, 441 (2007).
20. A. Butté, A.D. Peklak, G. Storti, M. Morbidelli, "RAFT Polymerization in Bulk and Emulsion", *Macromol. Symp.,***248**, 168 (2007).
21. L. Melter, L. Aumann, G. Ströhlein, A. Butté, M. Mazzotti, M. Morbidelli, "Adsorption Properties of Monoclonal Antibody Variants in Analytical Scale Cation-Exchange Chromatography", *J. Chromatogr. A,* **1154**, 121 (2007).
22. V. Mittal, N.B. Matsko, A. Butté, M. Morbidelli, "Synthesis of Temperature Responsive Polymer Brushes from Polystyrene Latex Particles Functionalized with ATRP Initiator", *Eur. Polym. J.*, **43**, 4868 (2007).
23. L. Aumann, A. Butté, M. Mazzotti, M. Morbidelli, B. Schenkel, K. Büscher, "Modeling of the Chromatographic Solvent Gradient Reverse Phase Purification of a Multicomponent Polypeptide Mixture", *Sep. Sci. Technol.,* **43**, 1310 (2008).
24. V. Mittal, N.B. Matsko, A. Butté, M. Morbidelli, "Swelling Deswelling Behavior of PS-PNIPAAM Copolymer Particles and PNIPAAM Brushes Grafted from Polystyrene Particles & Monoliths", *Macromol. Mat. Eng.*, **293**,491 (2008).
25. V. Mittal, N.B. Matsko, A. Butté, M. Morbidelli, "PNIPAAM Grafted Polymeric Monoliths Synthesized by Reactive Gelation Process and Their Swelling Deswelling Characteristics", *Macromol. Rea. Eng.*, **2**, 215 (2008).
26. L. Melter, A. Butté, M. Morbidelli, "Preparative Weak Cation-Exchange Chromatography of Monoclonal Antibody Variants. 1. Single Component Adsorption", *J. Chromatogr. A,* **1200**, 156 (2008).
27. A. Butté, G. Storti, M. Mazzotti, "Shock Formation in Binary Systems with Nonlinear Characteristic Curves", *Chem. Eng. Sci.*, **63**, 4159 (2008).
28. N. Forrer, O. Kartachova, A. Butté, M. Morbidelli, "Investigation of the porosity variation during chromatographic experiments", *I&EC Res.*, **47**, 9133 (2008).
29. N. Forrer, A. Butté, M. Morbidelli, "Chromatographic behavior of a polyclonal IgG mixture on a strong cation exchanger column. Part I: Adsorption Characterization", *J. Chromatogr. A*, **1214**, 59 (2008).
30. N. Forrer, A. Butté, M. Morbidelli, "Chromatographic behavior of a polyclonal IgG mixture on a strong cation exchanger column. Part II: Adsorption Modeling", *J. Chromatogr. A*, **1214**, 71 (2008).
31. M. Lattuada, M. Furlan, A. Butté, M. Morbidelli, "Novel Anisotropic Porous Materials through Self-Assembly of Super-Paramagnetic Particles", Chimia, **63**, 78 (2009)
32. A. Franke, N. Forrer, A. Butté, B. Cvijetić, M. Morbidelli, M. Jöhnck, M. Schulte, "Role of the ligand density in cation exchange materials for the purification of proteins", *J. Chromatogr. A*, **1217**, 2216 (2010).
33. M. Bechtle, A. Butté, M. Morbidelli, "Preparation of macroporous methacrylate-based monoliths for chromatographic applications by the Reactive Gelation Process", *J. Chromatogr. A*, **1217**, 4675 (2010).

34. A. Franke, A. Butté, M. Morbidelli, "Behavior of human serum albumin on strong cation exchange resins", *J. Chromatogr. A*, **1217**, 5484 (2010).
35. A. Franke, A. Butté, M. Morbidelli, "Behavior of human serum albumin on strong cation exchange resins. II. Simulation", *J. Chromatogr. A*, **1217**, 5492 (2010).
36. L. Boudesoque, N. Amarouche, P. Lameiras, J.M. Nuzillard, M. Giraud, J. McGarrity, F. Quattrini, A. Butté, J.H. Renault, "A new versatile process for peptide purification using centrifugal partition chromatography", *Biopolymers*, **96**, 429 (2011).
37. P. Arosio, M. Owczarz, H. Wu, A. Butté, M. Morbidelli, "End-to-end self-assembly of RADA 16-I nanofibrils in aqueous solutions", *Biophysical Journal*, **102**, 1617 (2012)
38. D. Getaz, S.B. Hariharan, A. Butté, M. Morbidelli, "Modeling of ion-pairing effect in peptide reversed-phase chromatography". *J. Chromatogr. A*, **1249**, 92 (2012).
39. P. Marchetti, A. Butté, A. G. Livingston, "An improved phenomenological model for prediction of solvent permeation through ceramic NF and UF membranes", *J. Membr. Sci.*, **415-416**, 444 (2012).
40. N. Amarouche, L. Boudesoque, P. Lameiras, J.M. Nuzillard, M. Giraud, A. Butté, F. Quattrini, R. Kapel, I. Marc, J.H. Renault, "Mixed ion-exchange centrifugal partition chromatography: an efficient solution for peptide separation", *J. Peptide Sci.*, **18**, S36 (2012).
41. N. Amarouche, L. Boudesoque, M. Giraud, A. Butté, F. Quattrini, J.H. Renault, "New biphasic solvent systems for the purification of non-ionic synthetic hydrophobic peptides by Centrifugal Partition Chromatography", *J. Peptide Sci.*, **18**, S197 (2012).
42. D. Getaz, G. Stroehlein, A. Butté, M. Morbidelli, "Model-based design of peptide chromatographic purification processes", *J. Chromatogr. A*, **1284**, 69 (2013).
43. D. Getaz, A. Butté, M. Morbidelli, "Model-based design space determination of peptide chromatographic purification processes", *J. Chromatogr. A*, **1284**, 80 (2013).
44. P. Marchetti, A. Butté, A. Livingston, "Quality by Design for peptide nanofiltration: fundamental understanding and process selection", *Chem. Eng. Sci.*, **101**, 200 (2013).
45. P. Marchetti, A. Butté, A. Livingston, "NF in organic solvent / water mixtures: role of preferential solvation", *J. Membr. Sci.*, **444**, 101 (2013).
46. P. Marchetti, A. Butté, A. Livingston, "Reactive Peptide Nanofiltration", *ACS Symposium Series*, **1124**, 121 (2013).
47. N. Amarouche, L. Boudesocque, M. Giraud, F. Quattrini, J. McGarrity, A. Butté, L. Marchal, A. Foucault, J.H. Renault, "Purification of a Modified Cyclosporine A by Co-Current Centrifugal Partition Chromatography: process development and intensification", *J. Chromatogr. A*, **1311**, 72 (2013).
48. N. Amarouche, M. Giraud, L. Forni, A. Butté, F. Edwards, J.H. Renault, "Two New Solvent Scales for Protected Synthetic Peptide Purification by Centrifugal Partition Chromatography", *J. Chromatogr. A*, submitted for publication (2013).

PATENTS

- A. Butté, G. Storti, M. Morbidelli, "Process for producing homo- and co-polymers by RAFT miniemulsion polymerization", EP 1 205 492 (Nov. 2000)
- A. Butté, F. Quattrini, G. Storti, M. Morbidelli, "Process for producing homo- and co-polymers by RAFT emulsion polymerization", EP1533327(Nov. 2003), WO2005/047354(Jun. 2005)
- A. Butté, N. Marti, M. Küthe M. Morbidelli, "Method for producing macro-porous materials", EP 07019511(Oct. 2007)

BOOK CHAPTERS

- R. Zonca, A. Butté, S. Riva, M. Masi, M. Morbidelli and S. Carrá, "Modeling of a steady state $H_2/N_2/O_2$ laminar jet diffusion flame", *AIDIC Conference Series*, **2**, 27 (1997)
- A. Butté, G. Storti, M. Morbidelli, "Pseudo Living Polymerization of Styrene in Miniemulsion", *DECHEMA Monographien*, **134**, 497 (1998)
- B. Apostolovic, F. Quattrini, A. Butté, G. Storti, M. Morbidelli, "Living Radical Polymerization in Emulsion by RAFT: Use of Cyclodextrins", *DECHEMA Monographien* (2004)
- A. Butté, G. Storti, M. Morbidelli, "Living Radical Polymerization and its Application to Emulsion Polymerization", *Handbook of Polymer Reaction Engineering*, Wiley - VCH (2005).
- J.C. de la Cal, J.R. Leiza, J.M. Asua, A. Butté, G. Storti, M. Morbidelli, "Emulsion Polymerization", Chapter 6, *Modern Styrene Polymerization*, Wiley and Sons (2005).

ORGANIZED COURSES AND CONFERENCES

- 04/2010: Course on design of experiments for the development of chemical process for the students of the Nemopur and Memtide European FP7 projects (Visp, CH).
- 09/2012: Co-chairmen in the International symposium on Preparative Chromatography and Allied Technologies (SPICA 2012, Brussels, Belgium).

INVITED TALKS

- 12/2000: "Miniemulsion Living Free Radical Polymerization". Johnson Polymer (Racine, WI, USA).
- 12/2000: "Miniemulsion Living Free Radical Polymerization". University of Wisconsin Chemical Engineering Department (Madison, WI, USA).
- 10/2001: "Miniemulsion Living Free Radical Polymerization". 7th International Workshop on Polymer Reaction Engineering (Hamburg, Germany)
- 10/2002: "Theoretical calculation of chain length distribution and particle size distribution in emulsion free radical polymerization". Rohm and Haas (Spring House, PA, USA)
- 04/2004: "Emulsion Living Free Radical Polymerization by RAFT: Modeling and Experiments". International Symposium on Polymers in Dispersed Media (Lyon, France)
- 10/2004: "Emulsion Living Free Radical Polymerization by RAFT: Modeling and Experiments". 8th International Workshop on Polymer Reaction Engineering (Hamburg, Germany)
- 10/2004: "Synthesis of Macroporous Stationary Phase: the Reactive Gelation Process". SPICA 2004 (Aachen, Germany)
- 09/2006: "Emulsion Living Free Radical Polymerization", 4th IUPAC International Symposium on Radical Polymerization: Kinetics and Mechanism
- 10/2006: "Chromatographic Separation of Monoclonal Antibody Variants in Ion-Exchange Chromatography". SPICA 2006 (Innsbruck, Austria)
- 07/2007 "Living Free Radical Polymerization". Lamberti S.p.A. (Albizzate, Italy)
- 10/2007: "Production of Porous Materials by "Reactive Gelation". 9th International Workshop on Polymer Reaction Engineering (Hamburg, Germany)
- 10/2007: "Macroporous Polymeric Monoliths by Reactive Gelation for Protein Purification". ISPPP 2007 (Orlando, FL, USA)

- 12/2007: "Macroporous Polymeric Monoliths by Reactive Gelation for Protein Purification". Bia Separations (Ljubljana, Slovenia)
- 02/2008: "Macroporous Polymeric Materials". BASF (Ludwigshafen, Germany)
- 02/2008: "Modeling of Antibody Chromatographic Purification. From Materials to Processes". University of Frankfurt (Germany)
- 05/2008: "Role of Compartmentalization in Emulsion Polymerization". PREDICI Workshop on Emulsion Polymerization,CiT GmbH (Rastede, Germany)
- 05/2009: "Challenges in Peptide DSP: Introducing Quality by Design", GlaxoSmithKline (Stevenage, UK)
- 02/2010: "DSP Challenges in Peptides: Getting the Right Things Done", Asia Tides 2010 (Tokyo, Japan)
- 05/2010: "Implementing QbD - Opportunities for Cost Reduction and Process Improvement", 9th Biological Production Forum 2010 (Frankfurt, Germany)
- 06/2010: "Implementing QbD in DSP Development", Seminar of the Swiss Chemical Engineering Society (Basel, Switzerland)
- 02/2011: "Development of peptide procecess and use of QbD tools", InformEx 2011 (Charlotte, NC, USA).
- 03/2011: "Use of QbD in early stage development of APIs", DCAT Week 2011 (New York City, NY, USA).
- 11/2011: "Use of QbD in early stage development of APIs", World Drug Manufacturing forum 2011 (Berlin, Germany).
- 04/2012: "Quality Risk Management in the development of API production processes by QbD", Pharma QbD Forum 2012 (Berlin, Germany).
- 09/2012: "From Development to Commercial: Rules to Scale up, QbD, Regulatory and Process Validation". Workshop in SPICA 2012 (Brussels, Belgium).
- 09/2012: "Use of QbD in DSP Development of Peptide Processes", SPICA 2012 (Brussels, Belgium).
- 02/2013: "QbD in the Development of Peptide Processes: Integration of Upstream and Downstream", Therapeutic Peptides (Barcelona, Spain).