

i T P 2019

September 1-4

26th International Symposium on Electroseparation
and Liquid Phase-Separation Techniques



BOOK OF ABSTRACTS

TOULOUSE

September 1-4, 2019

France

www.itp2019.com



26th International Symposium on
Electro separation and Liquid Phase-Separation Techniques

University Paul Sabatier - TOULOUSE - France

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WELCOME WORDS

Welcome to the 26th international Symposium on Electro-separation and Liquid-Phase Separation Techniques, ITP 2019 !

We are pleased to welcome you at the University Paul Sabatier, Toulouse, for the **International Symposium on Electro- and Liquid Phase- Separation Techniques (ITP 2019)**. The ITP series was inaugurated in Belgium in 1979, and is one of the most recognized international meeting addressing the latest issues and innovations in all areas of electro- and liquid phase-separations techniques.

The ITP Symposium series provide a forum for high-level scientific exchanges between analytically oriented scientists from the whole world in a friendly atmosphere. The University of Toulouse, one of the oldest in Europa, was founded in 1229 and is one of the most famous in France (rank #5 in France according to the Times Higher Education in 2018). It is located in the south of France, where the "art de vivre" is well-known. Medieval city, Renaissance city, Age of Enlightenment city, city of rugby, city of aviation, city hosting 110,000 students and 7,000 researchers, city of the good food and wines. A city where the ITP fellows will remain for a long time

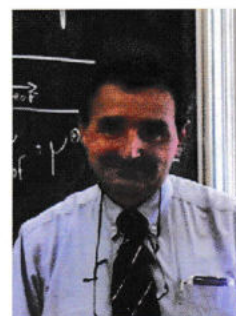
We will open this Symposium by thanking you for your valuable contribution and participation. We would like also to thank our sponsors for their generous support.

Welcome to ITP 2019 ! Welcome in Toulouse !



Pr. Hervé COTTET
Université de Montpellier

Co chairmen



Pr. François COUDERC
Université de Toulouse



ITP SYMPOSIUM HISTORY



o.	Year	Chair(s)	Place (Country)
1	1979	A. Adam & C. Schots	Baconfoy (Belgium)
2	1980	F.M. Everaerts	Eindhoven (The Netherlands)
3	1982	C.J. Holloway	Gosslar (Germany)
4	1984	Z. Prusik	Hradec Kralove (Czechoslovakia)
5	1986	F.M. Everaerts	Maastricht (The Netherlands)
6	1988	E. Kenndler	Vienna (Austria)
7	1990	D. Kaniansky	Tatranska Lomnica (Czechoslovakia)
8	1992	S. Fanali	Rome (Italy)
9	1994	F. Kilar	Budapest (Hungary)
10	1996	B. Gas	Prague (Czech)
11	1998	P.G. Righetti	Venice (Italy)
12	2000	D. Kaniansky & E. Kenndler	Bratislava (Slovak) – Vienna (Austria)
13	2002	M.L. Riekkola	Helsinki (Finland)
14	2004	S. Fanali & M.G. Quaglia	Rome (Italy)
15	2006	G. Peltre	Paris (France)
16	2008	V. Cucinotta	Catania (Italy)
17	2010	Z. El Rassi	Baltimore, MD (USA)
18	2011	B. Chankvetadze	Tbilisi (Georgia)
19	2012	Z. El Rassi	Baltimore (USA)
20	2013	A. Cifuentes & J. Hernández-Borges	Puerto de la Cruz (Spain)
21	2014	M. Tavares & E. Carrilho	Natal (Brazil)
22	2015	M.-L. Riekkola & Heli Sirén	Helsinki (Finland)
23	2016	Z. El Rassi & Blanca Lapizco-Encinas	Minneapolis (USA)
24	2017	M. Markuszewski	Sopot (Poland)
25	2018	K. Otsuka	Kyoto (Japan)

INTERNATIONAL SCIENTIFIC COMMITTEE

Ana Maria Garcia-Campaña (Grenade, Spain)

Bezhan Chankvetadze (Tbilisi, Georgia)*

David Chen (Vancouver, Canada)*

Alejandro Cifuentes (Madrid, Spain)*

Hervé Cottet (Montpellier, France)**

François Couderc (Toulouse, France)**

Ziad El Rassi (Stillwater, USA)*

Salvatore Fanali (Rome, Italy)*

František Foret (Brno, Czech Republic)*

Carlos D. García (Clemson, SC, USA)*

Bohuslav Gas (Prague, Czech Republic)*

Václav Kašička (Prague, Czech Republic)*

Sergey Krylov (Toronto, Canada)

Jörg Kutter (Copenhagen, Denmark)

Blanca Lapizco-Encinas (Rochester, USA)*

Koji Otsuka (Kyoto, Japan)*

Marja-Liisa Riekkola (Helsinki, Finland)*

Marina Tavares (Sao Paulo, Brazil)*

Myriam Taverna (Paris, France)

Peter Willis (Pasadena, CA, USA)

*: Permanent Scientific Committee

** : Co chairmen 2019

Organization



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CEYZ**

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SCIENTIFIC PROGRAM

Sunday, 1st September 2019

Auditorium Marthe Condat		Council Room	
		Publishing workshop for young scientists Blanca Lapizzo-Encinas, Rochester Institute of Technology, Editor in Chief of ELECTROPHORESIS Hermann Wätzig, Technical University of Braunschweig, Editor in Chief of ELECTROPHORESIS Danielle Flemming, Wiley/Wiley-VCH publisher Weinheim, Managing Editor	14:00-15:00 SC 02
		Short Course: Data processing in capillary electrophoresis Pavel Dubsy & Magda Dohunová Faculty of Science, Charles University, Prague, Czech Republic	15:00-17:00 SC 04
17:15	OPENING SESSION Chairs: Hervé Cottet - IBMM, University of Montpellier, France, Francois Couderc - University Paul Sabatier, Toulouse, France		
17:30-18:15 PL 01	Instrumentation and Applications of Epitachophoresis František Foret - Institute of Analytical Chemistry, Czech Academy of Sciences, Brno, Czech Republic		
18:15-18:30	Social event honouring Ziad El Rassi Supported by Wiley and ELECTROPHORESIS		
18:30-20:00	Welcome reception		18:30-20:00



Monday, 2nd September 2019

Auditorium Marthe Condat		Council Room	
08:30	OPENING SESSION Chairs: Hervé Cottet - IBMM, University of Montpellier, France, Francois Couderc - University Paul Sabatier, Toulouse, France		
08:40	PLENARY SESSION Chairs: Bohuslav Gas - Charles University, Prague, Czech Republic, Hanno Stutz - University of Salzburg, Austria		
8:40-9:25 PL 02	Transient Incomplete Separation Facilitates Finding Accurate Equilibrium Dissociation Constant, K_d, of Protein-Small Molecule Complex Sergey N. Krylov - York University, Toronto, Canada		
09:30	Affinity Capillary Electrophoresis Chairs: Bohuslav Gas - Charles University, Prague, Czech Republic, Hanno Stutz - University of Salzburg, Austria	Liquid Chromatography 1 Chairs: Carlos D Garcia - Clemson University, South Carolina, USA, Koji Otsuka - Kyoto University, Japan	09:30
9:30-9:55 KN 01	Affinity Capillary Electrophoresis for Reliable Ligand Binding Assays Hermann Wätzig - Technical University, Braunschweig, Germany	Fast and efficient isolation of human biomacromolecules by immunoaffinity chromatography with monolithic disk columns Marja-Liisa Riekkola - University of Helsinki - Finland	9:30-9:55 KN 02
9:55-10:20 KN 03	Partial filling affinity capillary electrophoresis for study of noncovalent (bio)molecular interactions Václav Kašička - Institute of Organic Chemistry and Biochemistry, Czech Academy of Sciences, Prague, Czech Republic	Design of Monolithic Column Precursors and Their Post Polymerization Modifications with Various Ligands for Use in Liquid Phase Separation Techniques Ziad El Rassi - Oklahoma State University, Stillwater, USA	9:55-10:20 KN 04
10:20-10:35 OP 01	Assignment of complex species by affinity capillary electrophoresis: the case of Th(IV)-desferrioxamine B Vladimir Sladkov - Institut de Physique Nucléaire, IN2P3-CNRS, Université Paris-Sud, Université Paris-Saclay, Orsay, France	Simple analytical device for determination of aflatoxins using thin-layer chromatography imaging with a smartphone Chanida Puangpila - Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand	10:20-10:35 OP 02
10:35-10:50 OP 03	Development of Affinity Electrophoretic Method for Analysis of Molecular Interactions in Lipid Nano-Membrane Yukihiro Okamoto - Graduated School of Engineering Science, Osaka University, Osaka, Japan	Use of Cyclofructans, Cyclodextrins and Amino Acid Ester-Based Ionic Liquids in EKC and HPLC for Improved Chiral Separations Constantina Kaprissi-Christodoulou - Department of Chemistry, University of Cyprus, Nicosia, Cyprus	10:35-10:50 OP 04

Monday, 2nd September 2019 (next)

10:50-11:30	Coffee break		10:50-11:30
11:30	<p style="text-align: center;">Bioanalytical (1)</p> <p style="text-align: center;"><small>Chairs: Ziad El Rassi - Oklahoma State University, Stillwater, USA František Foret - Institute of Analytical Chemistry, Czech Academy of Sciences, Brno, Czech Republic</small></p>	<p style="text-align: center;">MS and Liquid Chromatography (2)</p> <p style="text-align: center;"><small>Chairs: David Chen - University of British Columbia, Vancouver, Canada, Marja-Liisa Riekkola - University of Helsinki, Finland</small></p>	11:30
11:30-11:55 KN 05	<p style="text-align: center;">Nanomaterials based electrochemical detectors in microchips electrophoresis for (bio) analytical applications</p> <p style="text-align: center;"><small>Alberto Escarpa - Universidad de Alcalá, Spain</small></p>	<p style="text-align: center;">Chiral and Conformational Analysis by Trapped Ion Mobility Spectrometry</p> <p style="text-align: center;"><small>Govert W. Somsen - Vrije University of Amsterdam, The Netherlands</small></p>	11:30-11:55 KN 06
11:55-12:20 KN 07	<p style="text-align: center;">Unique Microscale Separations Using Specific Interactions</p> <p style="text-align: center;"><small>Koji Otsuka - Kyoto University, Japan</small></p>	<p style="text-align: center;">Evaluation and comparison of different separation techniques coupled to ion-mobility mass spectrometry for the deciphering of molecular networks</p> <p style="text-align: center;"><small>Marianne Fillet - University of Liege, Belgium</small></p>	11:55-12:20 KN 08
12:20- 12:35 OP 05	<p style="text-align: center;">Selection of DNA aptamers based on separation of DNA-protein complexes from DNA library using Ideal-Filter Capillary Electrophoresis (IFCE)</p> <p style="text-align: center;"><small>Svetlana M. Krylova - York University, Toronto, Ontario, Canada</small></p>	<p style="text-align: center;">Linear Retention Index in Liquid Chromatography: New Approach for the Quality Control of Furcoumarins in Cosmetics and Food</p> <p style="text-align: center;"><small>Adriana Arigo - University of Messina, Polo Annunziata, Messina, Italy</small></p>	12:20- 12:35 OP 06
12:35- 12:50 OP 07	<p style="text-align: center;">DNA Thermal Stability Decreases with Increasing Solvent Viscosity</p> <p style="text-align: center;"><small>Nancy Stallwagen - University of Iowa, Iowa City, IA, USA</small></p>	<p style="text-align: center;">Evaluation of column dispersion in isocratic and gradient HPLC based on the behaviour of a set of compounds</p> <p style="text-align: center;"><small>Maria-Celia Garcia Alvarez Coque - University of Valencia, Burjassot, Spain</small></p>	12:35- 12:50 OP 08
12:50-13:05 OP 09	<p style="text-align: center;">Multiple Modes Capillary Electrophoresis : The Efficient Technology For Aptamers Selection And Bioanalysis</p> <p style="text-align: center;"><small>Feng Gu - School of Life Science, Beijing Institute of Technology, Beijing, China</small></p>	<p style="text-align: center;">Study of the retention mechanisms of bisphenols on reversed phase U-HPLC columns by molecular modeling and Artificial Neural Networks</p> <p style="text-align: center;"><small>Jean-Christophe Garrigues - University Paul Sabatier, Toulouse, France</small></p>	12:50-13:05 OP 10
13:00-13:40	Lunch seminar SCIEX (Auditorium Grignard)		13:00-13:40
13:40-14:40	Poster session		13:40-14:40
14:40	<p style="text-align: center;">Fundamentals (1)</p> <p style="text-align: center;"><small>Chairs: Doo Soo Chung - Institute Seoul National University, SNU Department of Chemistry, Rep. of Korea, Sergey Krylov - York University, Toronto, Canada</small></p>	<p style="text-align: center;">Particles / Polymers analysis</p> <p style="text-align: center;"><small>Chairs: Javier Hernández Borges - University of La Laguna, Tenerife, Canary Islands, Spain, Myriam Taverna - University of Paris Sud, France</small></p>	14:40
14:40-15:05 KN 09	<p style="text-align: center;">Electromigration in micro and nanoscale</p> <p style="text-align: center;"><small>Bohuslav Gaš - Charles University, Prague, Czech Republic</small></p>	<p style="text-align: center;">Particle separation and assessment with electric fields</p> <p style="text-align: center;"><small>Bianca H. Lapizco-Encinas - Rochester Institute of Technology, USA</small></p>	14:40-15:05 KN 10
15:05-15:30 KN 11	<p style="text-align: center;">Simplicity, as the key for analytical methodologies</p> <p style="text-align: center;"><small>Carlos D Garcia - Clemson University, South Carolina, USA</small></p>	<p style="text-align: center;">Free solution capillary electrophoresis to characterize proteins, drug carriers or rice, and to monitor drug loading and digestion</p> <p style="text-align: center;"><small>Patrice Castignolles - Western Sydney University, Australia</small></p>	15:05-15:30 KN 12
15:30-15:45 OP 11	<p style="text-align: center;">What Sherlock sorely missed: the EVA technology for Cultural Heritage exploration</p> <p style="text-align: center;"><small>Pier Giorgio Righetti - Department of Chemistry, Politecnico di Milano, Milano, Italy</small></p>	<p style="text-align: center;">An Understanding of the Biological Roles of Glycoproteins through Reliable Quantitation of both Glycans and Glycopeptides</p> <p style="text-align: center;"><small>Yehia Mechref - Department of Chemistry and Biochemistry, Texas Tech University, Lubbock, USA</small></p>	15:30-15:45 OP 12
15:45-16:00 OP 13	<p style="text-align: center;">Investigation of cell mobility and deformability</p> <p style="text-align: center;"><small>Karel Klepárník - Institute of Analytical Chemistry of the Czech Academy of Sciences, Brno, Czech Republic</small></p>	<p style="text-align: center;">Nanofluidic Isolation, Detection and Manipulation of Single Nanoparticles and Extracellular Vesicles</p> <p style="text-align: center;"><small>Yan Xu - Department of Chemical Engineering, Graduate School of Engineering, Osaka Prefecture University, Japan</small></p>	15:45-16:00 OP 14
16:00-16:40	Coffee break		16:00-16:40
16:40	<p style="text-align: center;">PortASAP COST and Portable CE session</p> <p style="text-align: center;"><small>Chairs: Václav Kašička - Institute of Organic Chemistry and Biochemistry, Czech Academy of Sciences, Prague, Czech Republic, Yoann Ladner - University of Montpellier, France</small></p> <div style="text-align: center;">   </div>	<p style="text-align: center;">Bioanalytical (2)</p> <p style="text-align: center;"><small>Chairs: Ana M. Garcia-Campaña - University of Granada, Spain, Frederic Robert - SEBIA, Evry, France</small></p>	16:40
16:40-17:05 KN 13	<p style="text-align: center;">Open source hardware in chemical analysis: Tools or toys?</p> <p style="text-align: center;"><small>Guillaume Erny - University of Porto, Portugal</small></p>	<p style="text-align: center;">HPLC and cylindrical PAGE purification of RNA aptamers with single nucleotide resolution</p> <p style="text-align: center;"><small>Li Niu - University at Albany, New York, USA</small></p>	16:40-17:05 KN 14
17:05-17:20 OP 15	<p style="text-align: center;">Open source capillary electrophoresis device for quality control of medicines</p> <p style="text-align: center;"><small>Samuel Roth - Head of Chemical Analysis Services, School of Engineering and Architecture of Fribourg, Fribourg, Suisse</small></p>	<p style="text-align: center;">Preclinical Pharmacokinetic Exploration of Novel Combination for the Treatment of Prostate Cancer Using a Validated UHPLC-QTOF-MS Method</p> <p style="text-align: center;"><small>David Paul - St. James College of Pharmaceutical Sciences- India</small></p>	17:05-17:20 OP 16
17:20-17:35 OP 17	<p style="text-align: center;">Portable centrifugal microfluidic platforms for on-site analysis of herbicides</p> <p style="text-align: center;"><small>Mercedes Vasquez - School of Chemical Sciences, National Centre for Sensor Research, Dublin City University, Glasnevin, Ireland</small></p>	<p style="text-align: center;">Direct counting of exosomes in a culture medium with laser-induced fluorescence</p> <p style="text-align: center;"><small>Takashi Kaneta - Department of Chemistry, Graduate School of Natural Science and Technology, Okayama University, Okayama, Japan</small></p>	17:20-17:35 OP 18
17:35-17:50 OP 19	<p style="text-align: center;">Digital microfluidics - analytical open-source hardware</p> <p style="text-align: center;"><small>Jelena Gorbatsova - Centre of Microfluidics, KBI, TalTech, Tallinn, Estonia</small></p>	<p style="text-align: center;">Quantitative proteomics of exosomes secreted by liver cells</p> <p style="text-align: center;"><small>Djuro Josic - Juraj Dobrila University, Pula, Croatia</small></p>	17:35-17:50 OP 20
17:50-18:05 OP 21	<p style="text-align: center;">Using portable CE instruments for determining banned compounds in situ</p> <p style="text-align: center;"><small>Mihkel Kallurand - Tallinn University of Technology, Tallinn, Estonia</small></p>	<p style="text-align: center;">Determination of Exosomal Membrane Proteins CD63 by Capillary Electrophoresis</p> <p style="text-align: center;"><small>Yumeki Tani - Department of Chemistry, Graduate School of Natural Science and Technology, Okayama University, Okayama, Japan</small></p>	17:50-18:05 OP 22
19:00-20:00	Basilica Saint-Sernin organized tour		19:00-20:00

Tuesday, 3rd September 2019

Auditorium Marthe Condat		Council Room	
08:30	OPENING SESSION Chairs: Hervé Cottet - IBMM, University of Montpellier, France, Francois Couderc - University Paul Sabatier, Toulouse, France		
08:40	PLENARY SESSION Chairs: Marianne Fillet - University of Liege, Belgium, Georges Nouadje - SEBIA, Evry, France		
8:40-9:25 PL 03	Capillary electrophoresis mass spectrometry for top-down analysis of large proteins David Chen - University of British Columbia, Vancouver, Canada		
09:30	Bioanalytical (3) Chairs: Marianne Fillet - University of Liege, Belgium, Georges Nouadje - SEBIA, Evry, France	Young Session (1) Chairs: Patricia Castignolles - Western Sydney University, Australia, Guillaume Erny - University of Porto, Portugal	09:30
9:30-9:55 KN 15	Alliances of different CE and CE-MS approaches for the PTM characterization of allergens Hanno Stutz - University of Salzburg, Austria	Metabolomics, a key technology in the emerging field of gut microbiota Carolina Simó - Institute of Food Science Research (CIAL), Madrid, Spain	9:30-9:55 KN 16
9:55-10:10 OP 23	A fully automated stalling-out assisted liquid-liquid extraction (A-SALLE) procedure coupled with on-line stacking for the analysis of tyrosine kinase inhibitors (TKIs) in human plasma Yoann Ladner - University of Montpellier, France	Imaged capillary isoelectric focusing coupled to mass spectrometry: online ICIEF-ESI-MS of monoclonal antibodies (mAb) Johannes Schlecht - Faculty of Chemistry, Aalen University, Aalen, Germany	9:55-10:10 OP 24
10:10-10:25 OP 25	Capillary Electrophoresis for Quantitative Analysis of Dried Blood Spot Samples Pavel Kubáň - Institute of Analytical Chemistry, Czech Academy of Sciences, Brno, Czech Republic	Albuminome, a new way to discover new disease biomarkers: Alzheimer's Disease as a study case Emilie Rossi - Institut Galien Paris Sud, UMR8612, Protein and Nanotechnology in Analytical Science (PNAS), CNRS, Univ. Paris-Sud, Université Paris-Saclay, Châtenay-Malabry, France	10:10-10:25 OP 26
10:25-10:40 OP 27	Purpose-made CE instrumentation for pharmaceutical and diagnostic applications Thanh Duc Mai - Institut Galien Paris Sud, UMR 8612, Protein and Nanotechnology in Analytical Science (PNAS), CNRS, Univ. Paris-Sud, Univ. Paris-Saclay, Châtenay-Malabry, France	Low-cost paper-origami DNA microfluidics for rapid microbial analysis Zhugen Yang - Cranfield Water Science Institute, Cranfield University, Bedfordshire, United Kingdom	10:25-10:40 OP 28
10:40-10:55 OP 29	Determination of drugs of abuse in oral fluid by capillary electrophoresis using fluorescence detection Piret Saar-Reismaa - Department of Chemistry and Biotechnology, Tallinn University of Technology, Tallinn, Estonia.	Ultra-miniaturized weak affinity chromatography for protein-ligand interaction study: application to membrane proteins, targets of high pharmaceutical interest Lucile Lecas - Université de Lyon, Institut des Sciences Analytiques, UMR 5280, CNRS, Université Lyon 1, Villeurbanne, France	10:40-10:55 OP 30
10:55-11:30	Coffee break		10:55-11:30
11:30	Bioanalytical (4) Chairs: Frederic Ginot - Picometrics Technologies, Labège, France, Jörg Kutter - University of Copenhagen, Denmark	Young Session (2) Chairs: Blanca H. Lapizco-Encinas - Rochester Institute of Technology, USA, Li Niu - University at Albany, New York, USA	11:30
11:30-11:55 KN 17	Capillary electromigration methods: a real alternative in food safety? Ana M. Garcia-Campaña - University of Granada, Spain	The challenge of plastic migrant analysis using nanomaterials Javier Hernández Borges - University of La Laguna, Tenerife, Canary Islands, Spain	11:30-11:55 KN 18
11:55-12:10 OP 31	Immobilization of enzymes on magnetic particles: recent experience with sulfotransferase and aldehyde oxidase Ann Van Schepdael - University of Leuven, Pharmaceutical Analysis, Leuven, Belgium.	Study and characterization of antigen-adjuvant interactions in vaccines by frontal analysis continuous capillary electrophoresis (FACCE) Camille Malburet - IBMM, University of Montpellier, CNRS, ENSCM, Montpellier, France	11:55-12:10 OP 32
12:10-12:25 OP 33	Characterization of the polyphenolic profile from different cultivars of Brassica juncea by comprehensive two-dimensional liquid chromatography coupled to mass spectrometry Katia Arena - Farmaceutiche ed Ambientali, University of Messina -Messina, Italy	µLAS Technology for RNA Separation Bayan Chami - LAAS-CNRS, Toulouse, France	12:10-12:25 OP 34
12:25-12:40 OP 35	Capillary Electrophoresis and Contactless Conductivity Detection for In Situ Analysis of Samples from Ocean Worlds Mauro Sergio Ferreira Santos - Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California	Metabolome/Glycome Analysis of Microscale Biological Samples by Capillary Electrophoresis-Laser Induced Fluorescence / Mass Spectrometry Coupled with a Large-volume Dual Preconcentration Technique Takayuki Kawai - RIKEN Center for Biosystems Dynamics Research, Osaka, Japan	12:25-12:40 OP 36
		The Development of Portable Illegal Drug of Abuse Analyzer: From Idea to Product Jekaterina Mazina-Sinkar - Chemistry and Biotechnology Institute, Tallinn University of Technology, Tallinn, Estonia	12:40-12:55 OP 38
12:55-13:30	Lunch seminar AGILENT TECHNOLOGIES (Auditorium Grignard)		12:55-13:30
	ITP permanent Scientific Committee (VIP room)		
13:30-14:30	Poster session		13:30-14:30
14:30-19:30	Walled city of Carcassonne visit		14:30-19:30
20:00-23:00	Gala dinner - Hôtel Dieu - Toulouse		20:00-23:00

Wednesday, 4th September 2019

Auditorium Marthe Condat		Council Room	
09:00	Bioanalytical (5) Chairs: Christian Neusüss - Aalen University, Germany, Govert W. Somsen - Vrije University of Amsterdam, The Netherlands	AFSEP session (1) Chairs: Jean-Christophe Garrigues - Université Paul Sabatier, Toulouse, France, Pascal Cardinal - Université de Rouen, France	09:00
9:00-9:25 KN 19	Taylor Dispersion Analysis in Biomedical Analysis: Sizing, Interaction Studies and Quantification of Biopharmaceuticals Jesper Østergaard - University of Copenhagen, Denmark	Capillary Electrophoresis, an efficient technique for Drug Screening related to protein aggregation diseases Myriam Taverna - University of Paris Sud, France	9:00-9:25 KN 20
9:25-9:40 OP 37	Sizing of pharmaceutical lipid-based drug delivery systems by Taylor dispersion analysis: monitoring enzymatic lipolysis Joseph Chamieh - IBMM, University of Montpellier, CNRS, ENSCM, Montpellier, France	Enhancing the robustness of your CE-MS data with ROMANCE: electrophoretic mobility made easy Victor Gonzalez-Ruiz - Analytical Sciences, School of Pharmaceutical Sciences, Universities of Geneva and Lausanne, Switzerland	9:25-9:40 OP 40
9:40-9:55 OP 39	Review of Efficient Procedures to Prevent Band Leaking in Toroidal Capillary Electrophoresis (a Quasi-continuous Circulating Layout to Perform Electrokinetic Separations) Tarsio B. Ledur-Kist - Institute of Biosciences, Federal University Rio Grande do Sul, Porto Alegre, Brazil	Polyelectrolyte multilayers coatings for the separation of proteins by capillary electrophoresis: influence of polyelectrolyte nature Laurent Leclercq - IBMM, University of Montpellier, CNRS, ENSCM, Montpellier, France	9:40-9:55 OP 42
9:55-10:10 OP 41	Chiral separation of cathinones and other novel psychoactive substances by capillary electrophoresis and capillary electrochromatography Martin Schmid - Institute of Pharmaceutical Sciences, Dept. of Pharmaceutical Chemistry, University of Graz, Austria	Development of a lab-on-a-chip for Proteomics Menel Ben Frej - Chimie ParisTech - PSL Research University, Paris France	9:55-10:10 OP 44
10:10-10:25 OP 43	Investigation of Enantioselective Interaction and Determination of Binding Constants of Two Calcium Channel Blockers using Capillary Electrophoresis Rath Rath - Institute of Medicinal and Pharmaceutical Chemistry, TU Braunschweig, Braunschweig, Germany	Development of enzymatic microreactors for analysis of monoclonal antibodies Meriem Dadouch - IBMM, University of Montpellier, CNRS, ENSCM, Montpellier, France	10:10-10:25 OP 46
Coffee break			
11:15	Novelties in electrophoretic devices Chairs: Jesper Østergaard - University of Copenhagen, Denmark Hermann Wätzig - Technical University, Braunschweig, Germany	AFSEP Session (2) Chairs: Agnès Hagège - Institut des Sciences Analytiques, Villeurbanne, France Laurent Leclercq - IBMM, University of Montpellier, France	11:15
11:15-11:45 KN 21	Thiolene-based Microfluidic Devices for Pharmaceutical Applications Jörg Kutter - University of Copenhagen, Denmark	A novel Capillary electrophoresis method to identify and quantify exosomes from bio fluids Marco Mbrani - Institut Galien Paris Sud, UMR 8612, Protein and Nanotechnology in Analytical Science (PNAS), CNRS, Univ. Paris-Sud, Châtenay-Malabry, France	11:15-11:30 OP 48
11:45-12:00 OP 45	A glass-based valve for 2D capillary electrophoresis and on-chip C4D Benjamin Rudisch - Institute for Theoretical and Physical Chemistry, Universität Tübingen, Tübingen, Germany	Assay of Kinases By Capillary Electrophoresis For Classifying Nucleoside-Analogues As Anti-Viral Molecules Ghassan Al Hamoui Dit Banni - Université d'Orléans, CNRS UMR 7311, Institut de Chimie Organique et Analytique (ICOA), Orléans, France	11:30-11:45 OP 50
12:00-12:15 OP 47	Optimization and modeling of matrix-free DNA separation based on electrohydrodynamic actuation in viscoelastic fluids Jeffrey Teillet - Laboratoire d'Analyse et d'Architecture des Systèmes, Toulouse, France	The use of bisphenols chromatographic retentions to describe their biological activities Clémence Gely - UMR 1331 INRAE/INVT Toxalim, Toulouse, France	12:00-12:15 OP 54
12:15-12:30 OP 49	Separation of long RNAs by capillary electrophoresis for rare disease diagnosis Pierre Emmanuel Gleizes, Centre de Biologie Intégrative, Toulouse, France	Analysis of fatty acids by perfluoro-MEKC Hai Yen Ta - IMRCP, CNRS UMR 5623, University Paul Sabatier, Toulouse, France	12:15-12:30 OP 56
Lunch seminar ELECTROPHORESIS (Auditorium Grignard)			
CA AFSEP Groupe CE (Council room)			
Poster session			
14:00	CE/MS Chairs: Carolina Simó - Institute of Food Science Research (CIAL), Madrid, Spain, Peter A. Willis - Jet Propulsion Laboratory, California Institute of Technology, Pasadena, USA	Bioanalytical (6) Chairs: Joseph Chamieh - IBMM, University of Montpellier, France, Alberto Escarpa - Universidad de Alcalá, Spain	14:00
14:00-14:25 KN 23	CE-CE-MS: Possibilities and Perspectives Christian Neusüss - Aalen University, Germany	Liquid Extraction Surface Analysis Coupled with Capillary Electrophoresis Doo Soo Chung - Institute Seoul National University - Department of Chemistry - South Korea	14:00-14:25 KN 22
14:25-14:40 OP 51	Single step separation of lanthanides and actinides by CE-ICPMS - A powerful tool for isotope analysis Erwan Dupuis - 1 DEN - Service d'Etudes Analytiques et de Réactivité des Surfaces (SEARS), CEA, Université Paris-Saclay, Gif sur Yvette, France	Electrokinetic Sample Extraction and Enrichment, a Smart Method for the Isolation of Traces of Polar Analytes from Sludge-Type Samples Demonstrated by the Isolation of Microcystins from Lake Sediments Thomas Welsch - Institute of Analytical and Bioanalytical Chemistry, Ulm University, Germany	14:25-14:40 OP 58
14:40-14:55 OP 53	Detection of a reduced monoclonal antibody (mAb) at low ng/ml concentration in biological samples by CE-MS Stephen Lock - Sciex, Warrington, United Kingdom	Size distribution of circulating cell-free DNA in plasma is an individual feature, as revealed by μLAS technology Frederic Ginot - Picometrics Technologies, Labège, France	14:40-14:55 OP 60
14:55	CLOSING SESSION Chairs: Hervé Cottet - IBMM, University of Montpellier, France, François Couderc - University Paul Sabatier, Toulouse, France		
14:55-15:40 PL 04	Separating Life from Non-Life on Ocean Worlds Peter A. Willis - Jet Propulsion Laboratory, California Institute of Technology, Pasadena, USA		
15:40-15:55	Awards ceremony Gerard Rozing		
15:55-16:00	ITP 2020 David Chen - University of British Columbia, Vancouver, Canada		
Farewell drink			
16:00			16:00

Investigation of Enantioselective Interaction and Determination of Binding Constants of Two Calcium Channel Blockers using Capillary Electrophoresis

Ratih Ratih^{1,2},

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The individual enantiomers of a racemic drug usually exhibit specific therapeutic efficacy. In order to achieve optimal therapeutic treatment, an enantioselective analytical method is needed for quality control. Capillary electrophoresis is an analytical method which shows high efficiency in enantiomeric separation. In this study, the enantioselectivity of two calcium channel blockers was investigated using chiral macromolecule as a selector in the background electrolyte of the capillary electrophoresis system. Polysaccharide-based and protein-based selectors were employed separately, each at different concentrations and conditions (e.g., pH value and applied voltage) to achieve baseline separation. Furthermore, the interaction of each enantiomer with human serum albumin as the most abundant protein in the biological system was studied. Mobility-shift affinity capillary electrophoresis was applied to perform the enantiomeric separation and the determination of binding constant. The apparent binding constant of each enantiomer was measured by nonlinear regression analysis. The *R*- and *S*- enantiomers of each drug model showed different binding constant values.

Keywords: enantioselective interaction, affinity capillary electrophoresis, human serum albumin, chiral selector

Acknowledgements

Ratih gratefully acknowledges the support by a Scholarship (BUDI-LN) from Indonesia Endowment Fund for Education (LPDP), Ministry of Research, Technology and Higher Education (RISTEK DIKTI), the Republic of Indonesia.

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
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Investigation of enantioselective interaction and determination of binding constants of two calcium channel blockers using capillary electrophoresis

ITP 2019, Toulouse

R. Ratih, M. Asmari, S. El Deeb, H. Wätzig, M. Stein
Institute of Medicinal and Pharmaceutical Chemistry
TU Braunschweig, Germany

Outlines

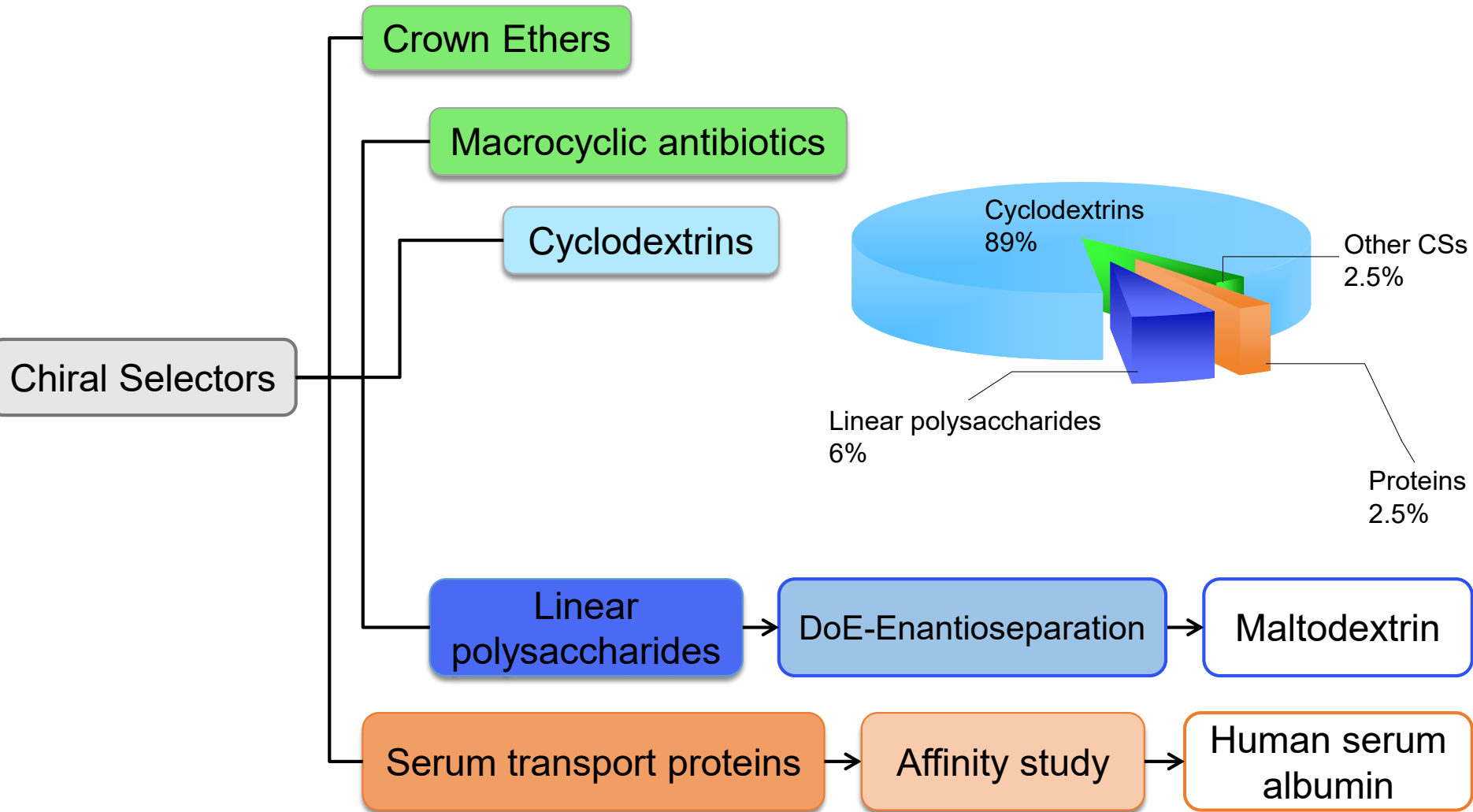
- **Direct chiral separation in free-solution**
 - Choice of chiral selectors
- **Applications**
 - DoE for enantioseparation method optimization
 - Simultaneous enantioseparation and binding constant determination

Chiral capillary electrophoresis

- **Electrical field to separate enantiomers of a racemic mixture**
 - Operate in free solution (buffer additives)
 - Does not require the immobilization of the selector

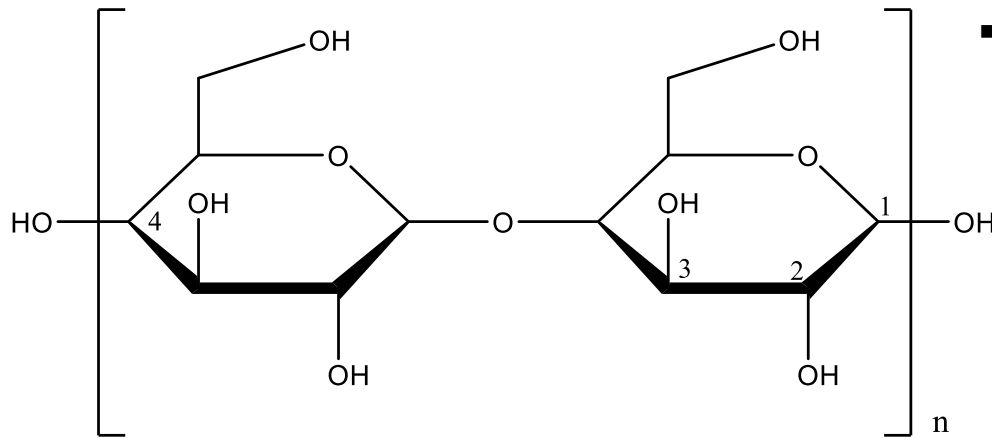
- **Selectors required to be:**
 - Soluble and chemically stable in the BGE
 - Stereoselective and form a transient diastomeric complex with each enantiomer
 - Exhibit fast complexation kinetics
 - Insignificant interference with the detection

Direct chiral separation using CE



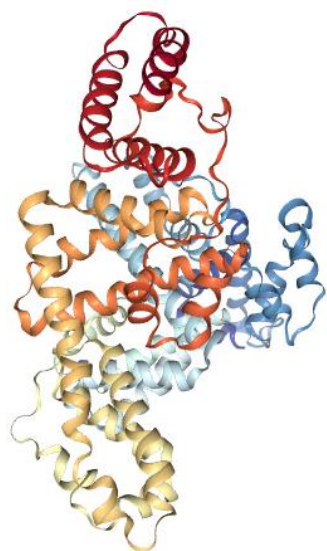
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Maltodextrins



- Consist of D-(+)-glucose as the monosaccharide unit that is connected through (1-4)- α linkage.
 - Characterized in terms of the dextrose equivalent (DE) number – degree of polymerization
- The **helical structure** present as the base of the enantioselectivity for different interactions such as:
 - Hydrophobic
 - Electrostatic
 - dipole-dipole
 - multiple hydrogen bonding

Human serum albumin



Being chiral by nature

- Considerable enantioselective towards chiral molecules.
- Interacts with a wide range of organic and inorganic compounds.

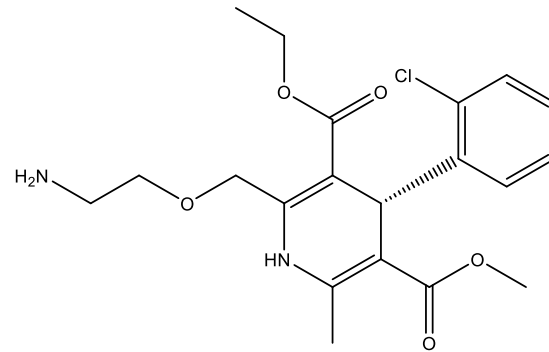
Two major binding sites referred as:

- Sudlow I (warfarin)
- Sudlow II (indole) occur as the most important region.

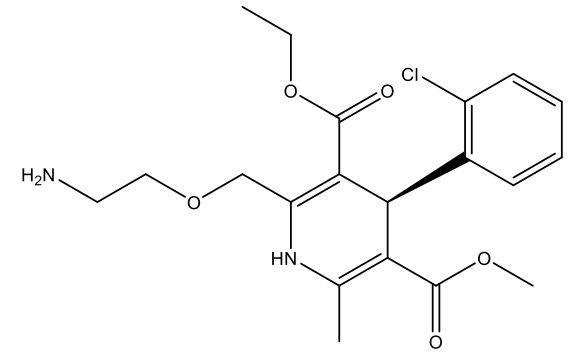
Majority of compound interactions with HSA can be **stereoselective**.

Racemic mixtures

Amlodipine besylate

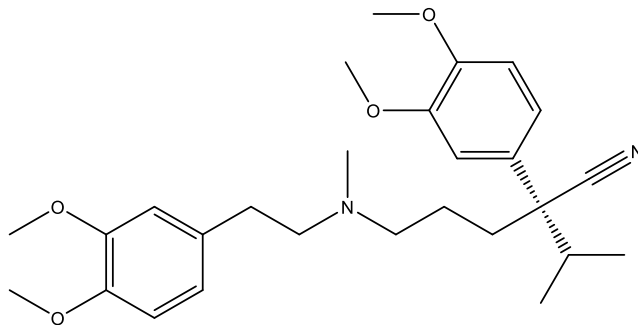


R-(+)-AML

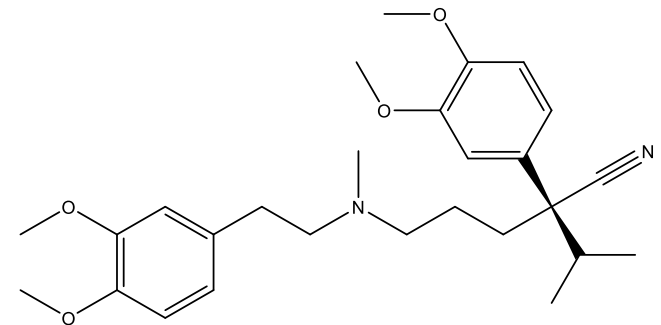


S-(-)-AML

Verapamil HCl

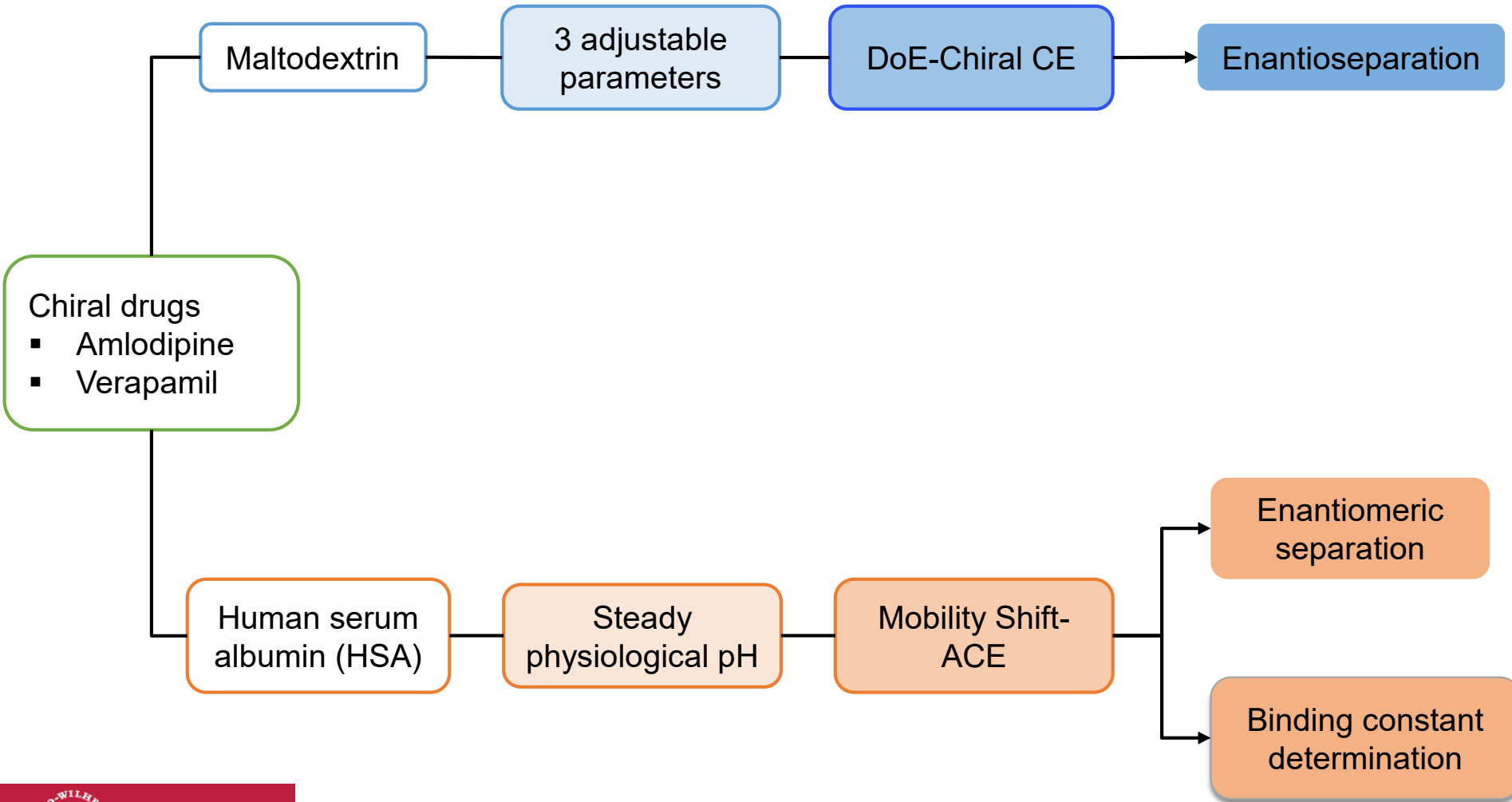


R-(+)-VER



S-(-)-VER

Enantioselective interaction study



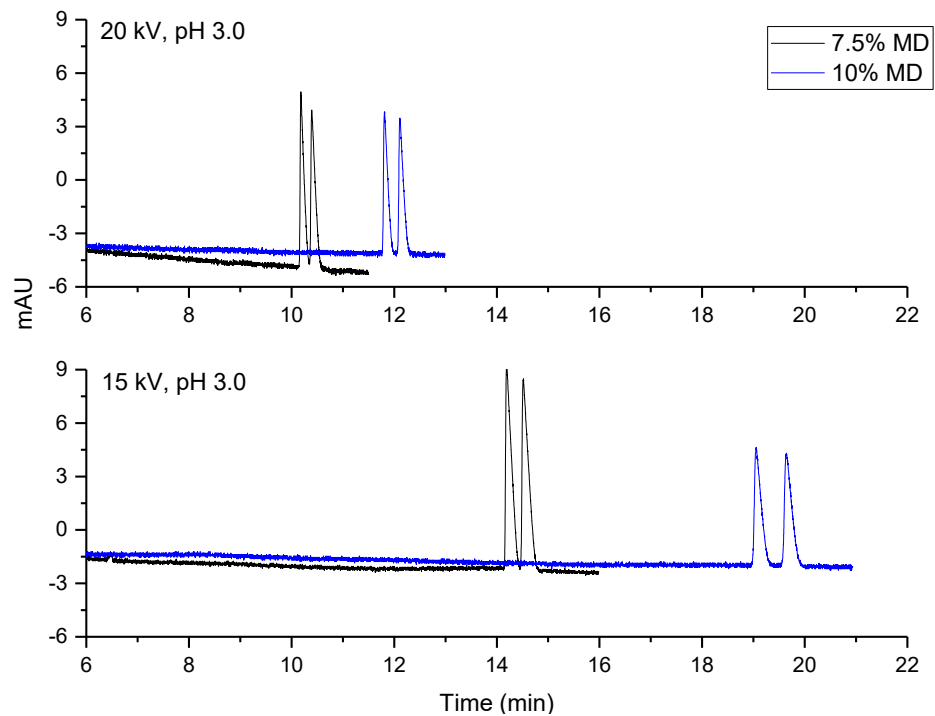
Maltodextrin-based chiral separation

Design of Experiment

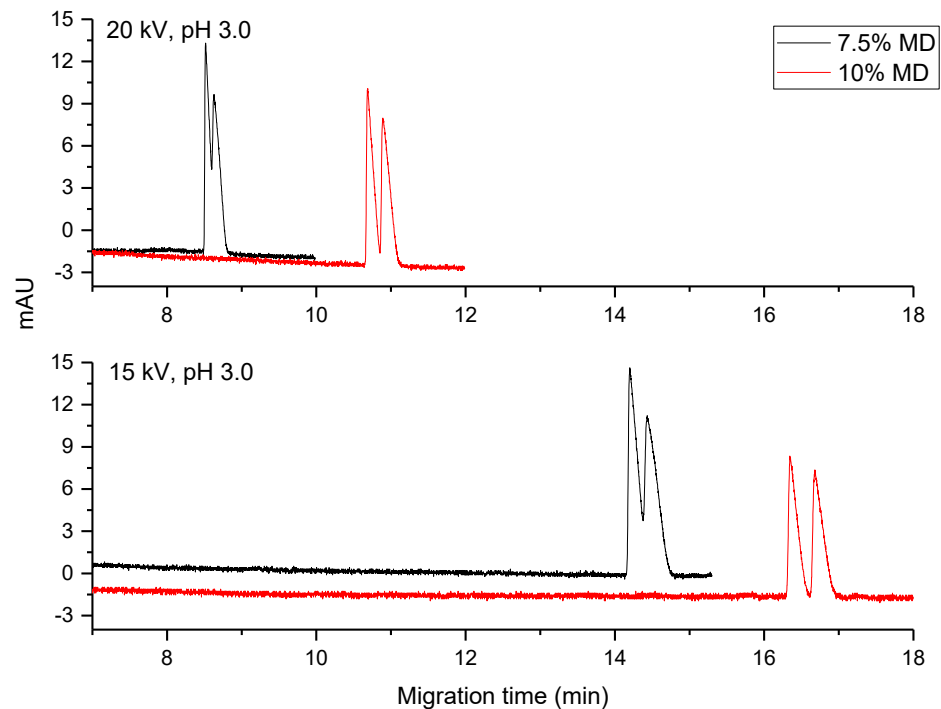


Initial enantiomeric separation

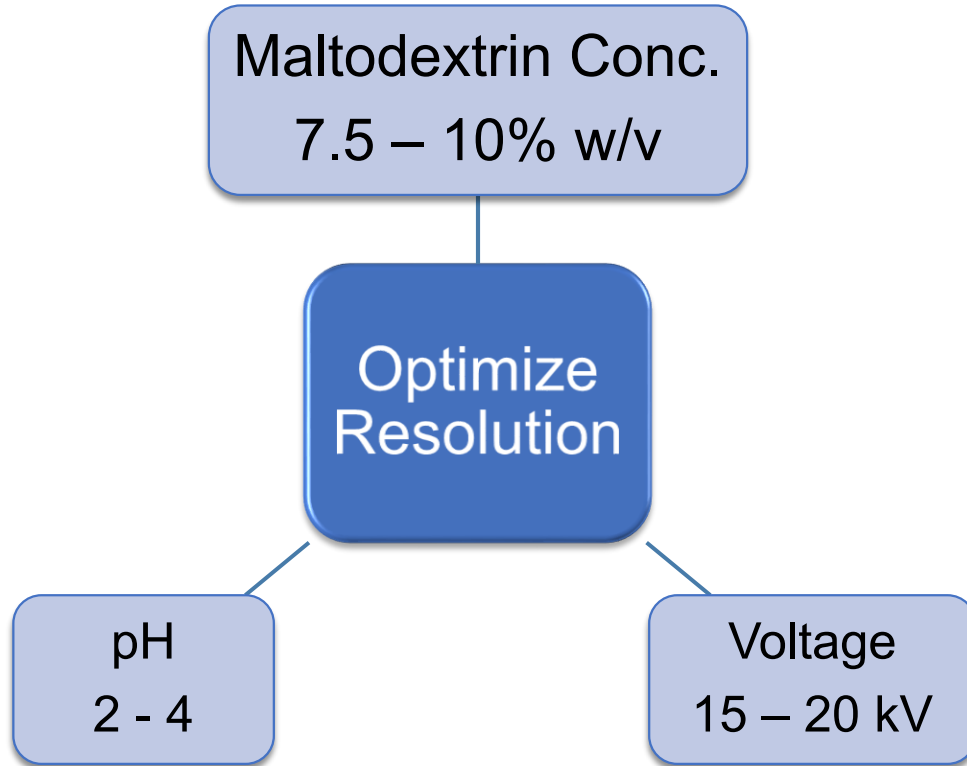
Amlodipine



Verapamil



Design of Experiment



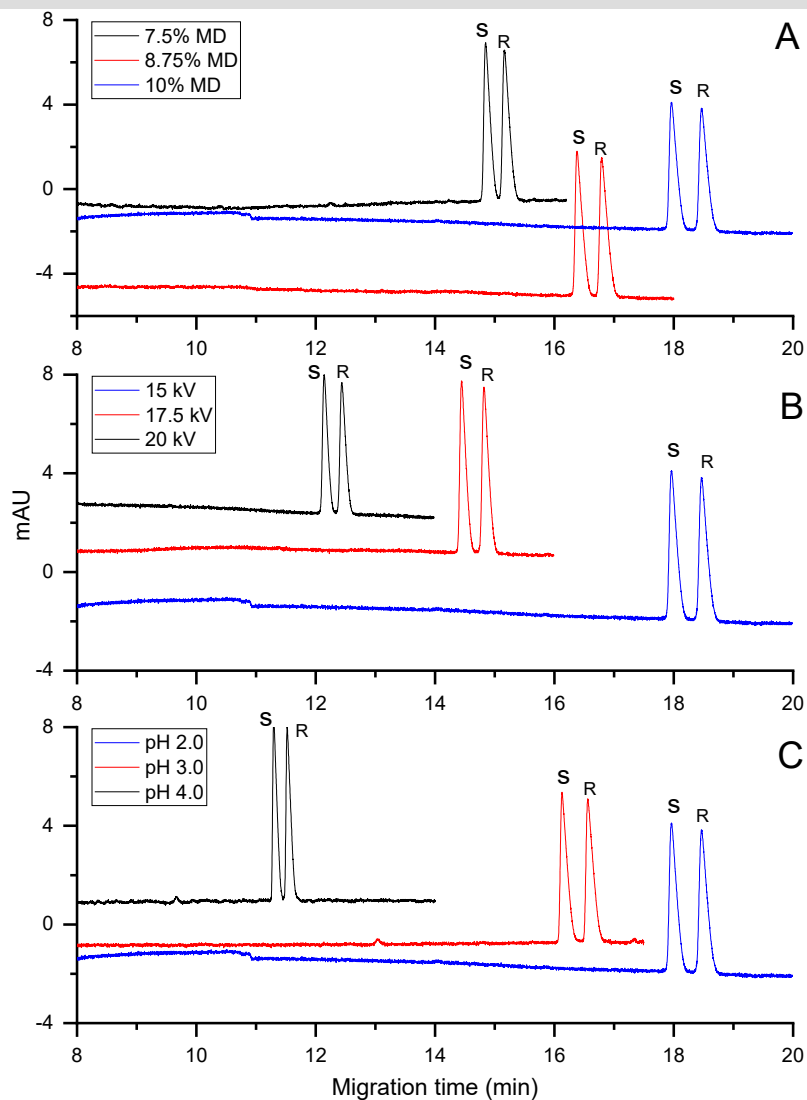
No.	kV	%MD	pH
1	20	10	2.0
2	15	8.75	2.0
3	15	10	4.0
4	15	10	2.0
5	15	10	3.0
6	17.5	10	2.0
7	17.5	7.5	3.0
8	15	7.5	2.0
9	20	7.5	2.0
10	20	10	4.0
11	20	8.75	3.0
12	17.5	8.75	4.0
13	20	8.75	2.0
14	15	7.5	4.0
15	20	7.5	4.0

Maltodextrin-based enantiomeric separation profile

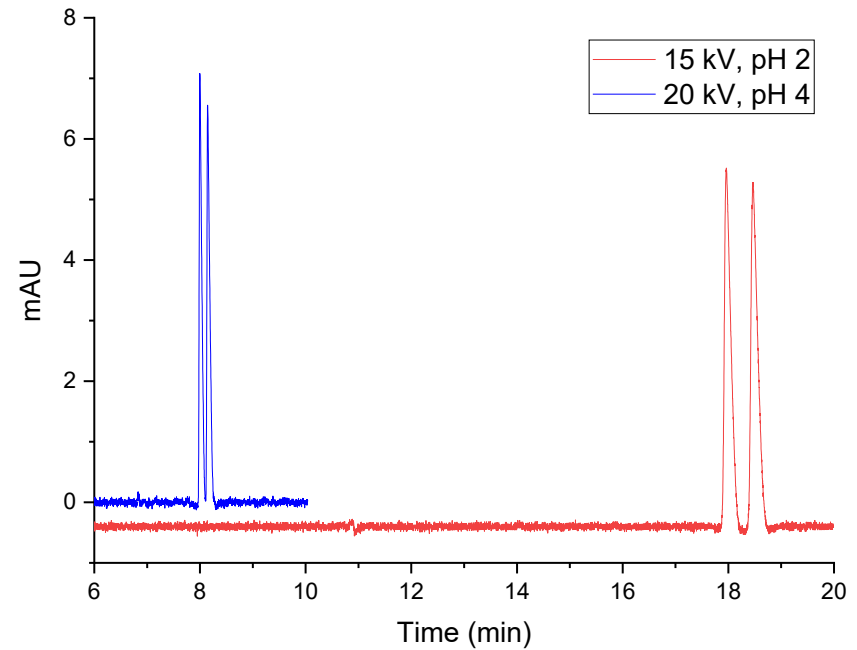
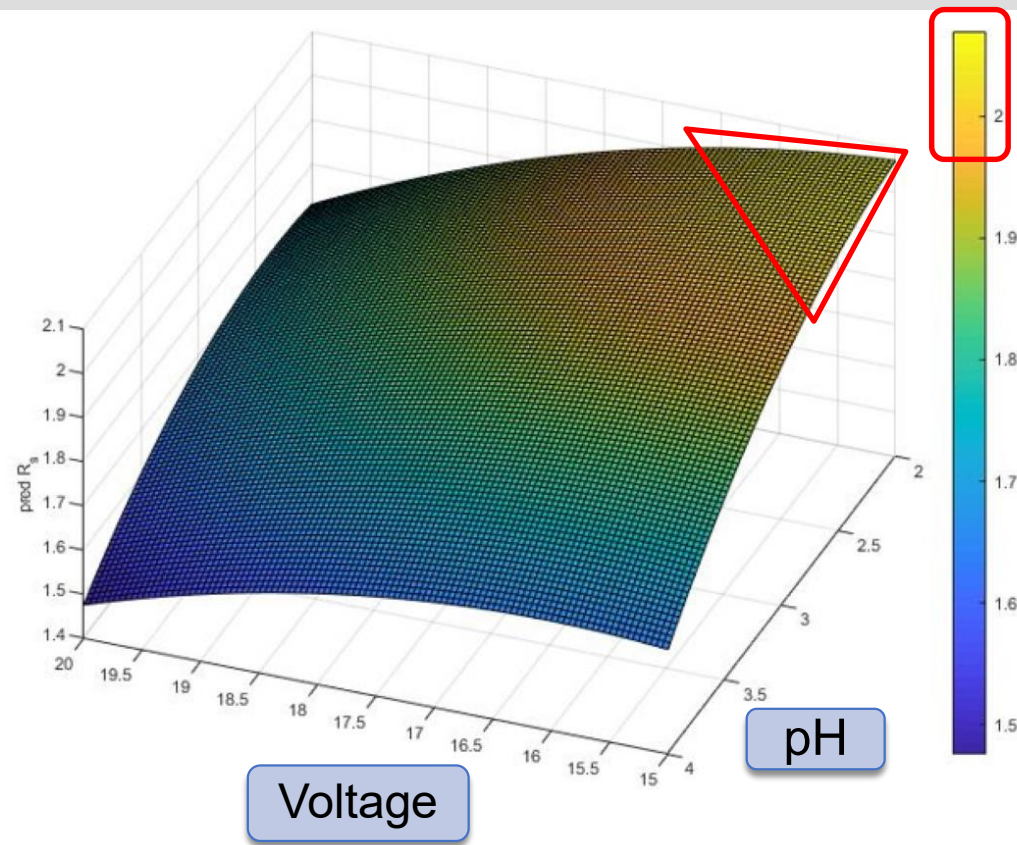
Maltodextrin
7.5 – 10% w/v

Voltage
15 – 20 kV

pH
2 - 4

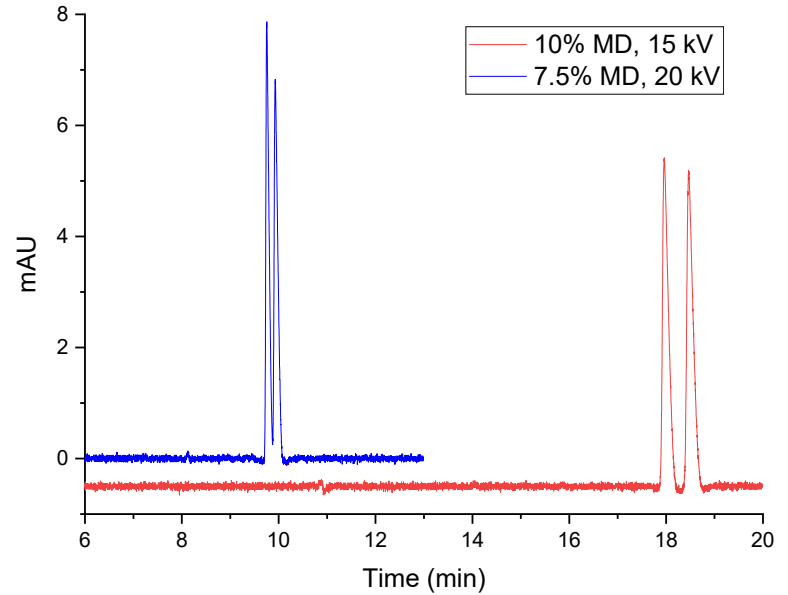
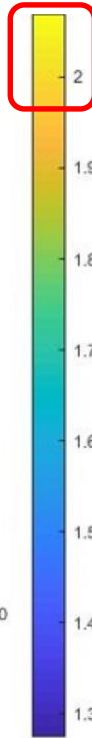
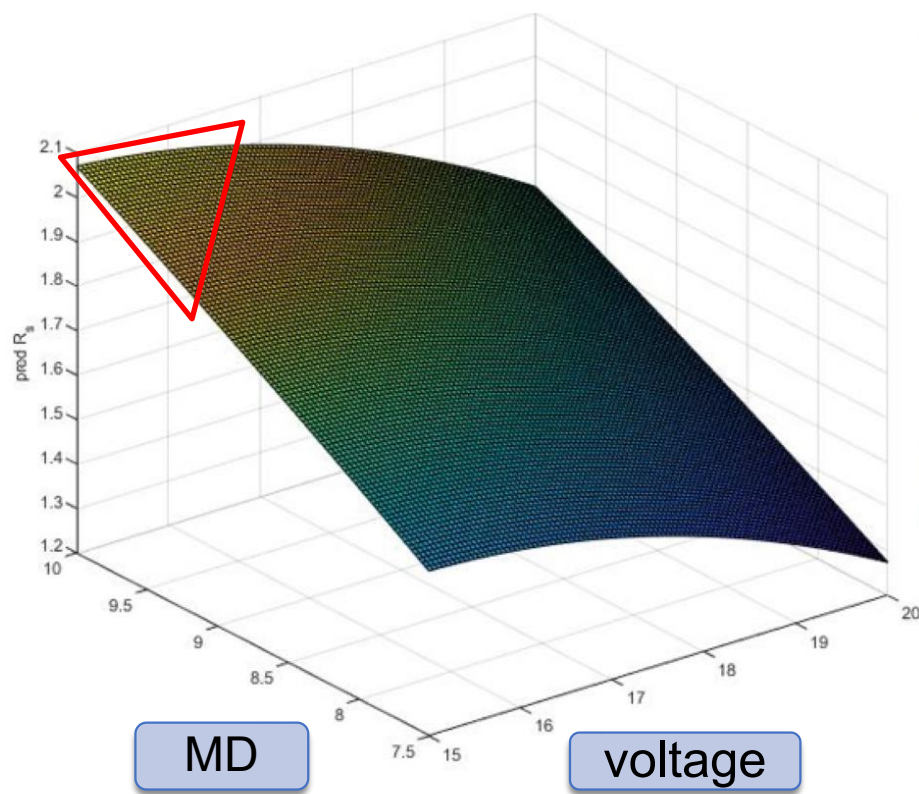


Predicted R_s at the highest conc. of MD



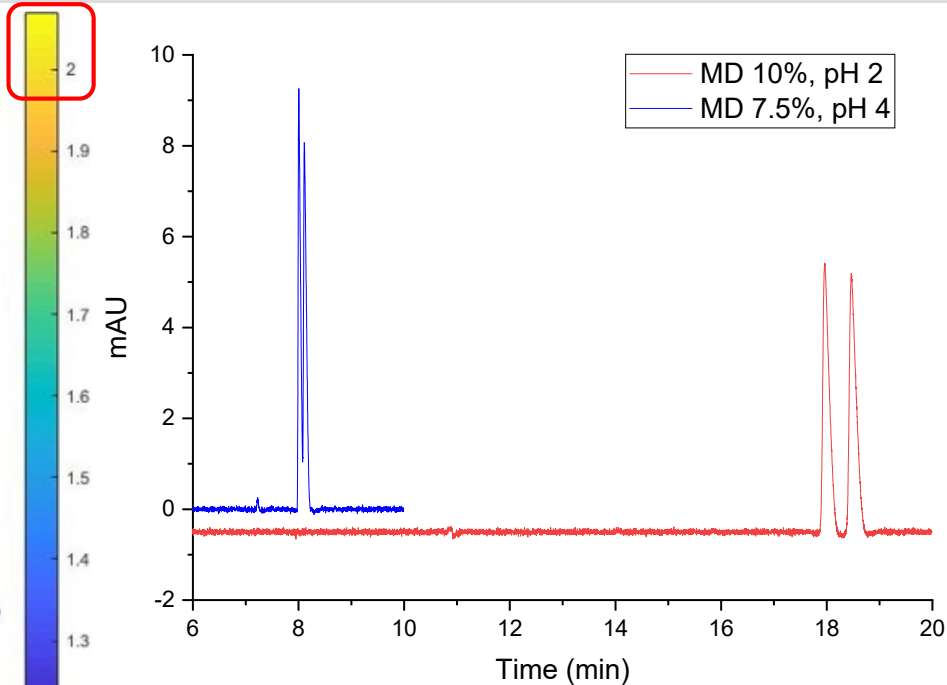
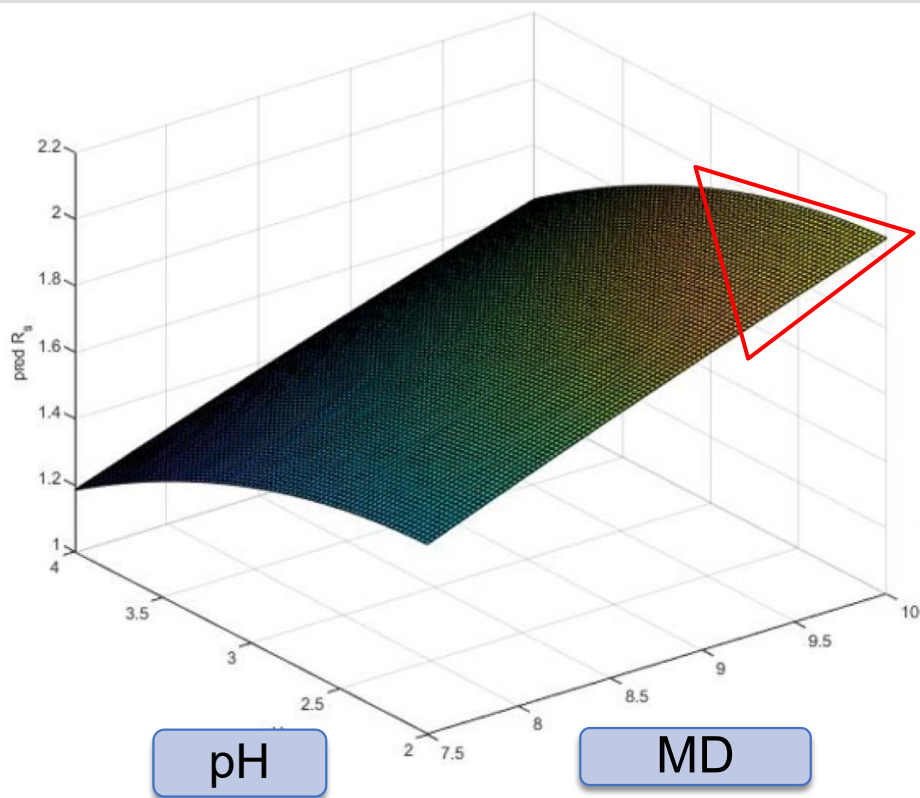
Run order	kV	%MD	pH	R_s	%RSD
1	20	10	2.0	1.73	0.25
3	15	10	4.0	1.61	0.10
4	15	10	2.0	2.10	0.13
5	15	10	3.0	1.96	0.07
6	17.5	10	2.0	1.93	0.06
10	20	10	4.0	1.47	0.09

Predicted R_s at the Lowest pH



Run Order	kV	%MD	pH	R_s	%RSD
1	20	10	2.0	1.73	0.25
2	15	8.75	2.0	1.80	0.02
4	15	10	2.0	2.10	0.13
6	17.5	10	2.0	1.93	0.06
8	15	7.5	2.0	1.59	0.11
9	20	7.5	2.0	1.31	0.06
13	20	8.75	2.0	1.46	0.02

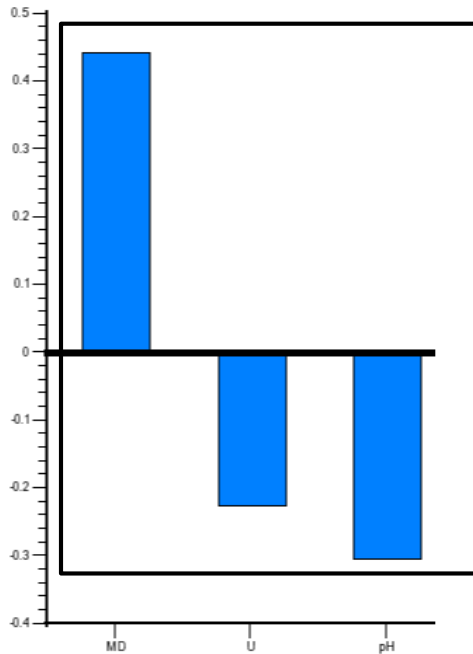
Predicted R_s at the lowest voltage



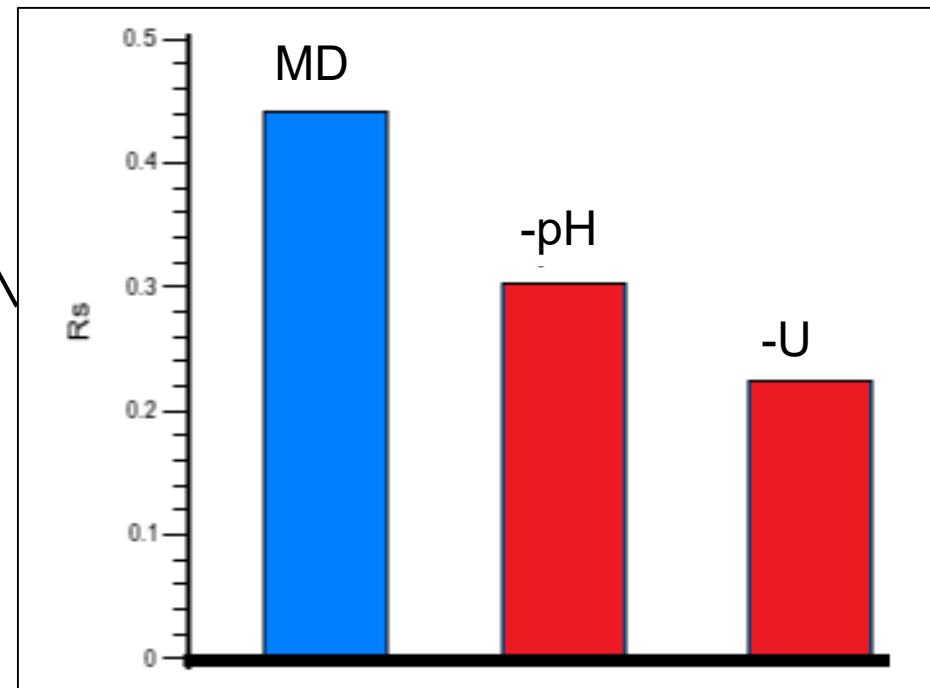
Run order	kV	%MD	pH	R_s	%RSD
2	15	8.75	2.0	1.80	0.02
3	15	10	4.0	1.61	0.10
4	15	10	2.0	2.10	0.13
5	15	10	3.0	1.96	0.07
8	15	7.5	2.0	1.59	0.11
14	15	7.5	4.0	1.19	0.07

Enantioselective interactions between MD and AML

- The *R*-(+)-AML bound stronger to Maltodextrin, which leads to a slower migration time compared to the *S*-(-)-AML.



- Enantiomers resolution depends on:
 1. Maltodextrin conc.
 2. pH
 3. Applied voltage



HSA-based in mobility shift-ACE

Chiral separation and binding constant determination

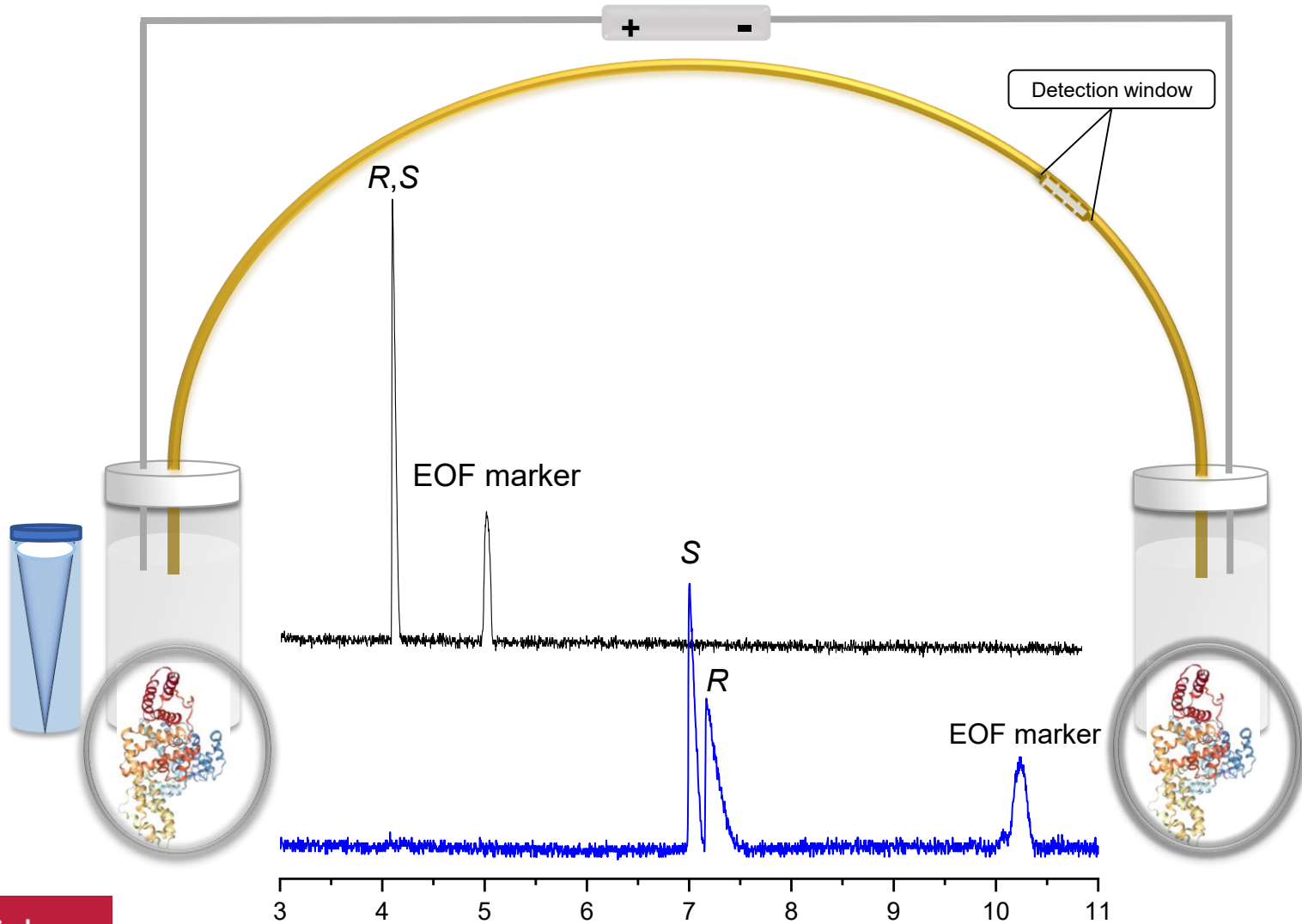


Mobility shift-affinity study

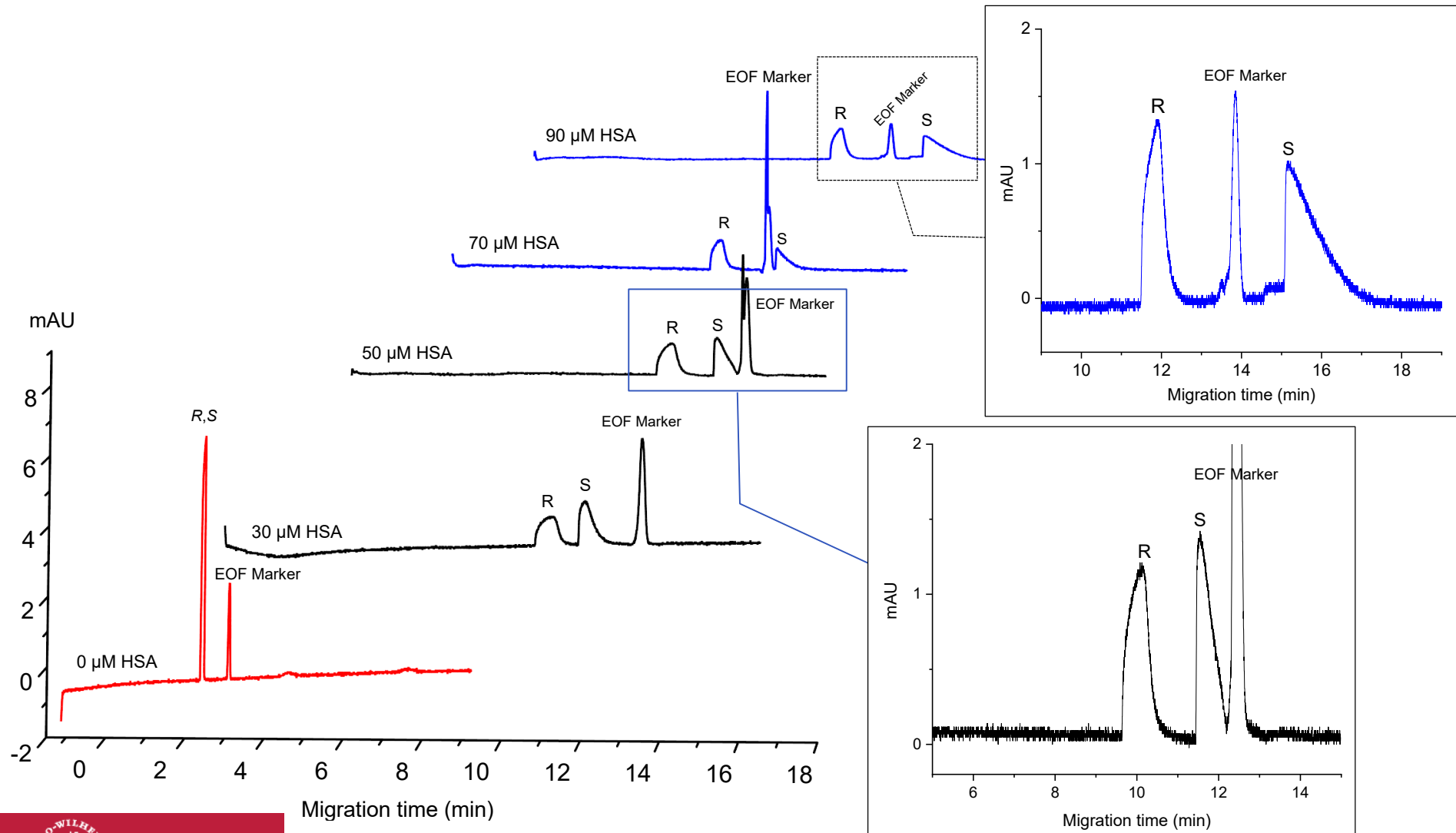
Binding constants determination as a function of total ligand concentrations and effective mobilities.

- The analyte does not need to be perfectly pure
- The concentration of the analyte does not need to be exactly known.

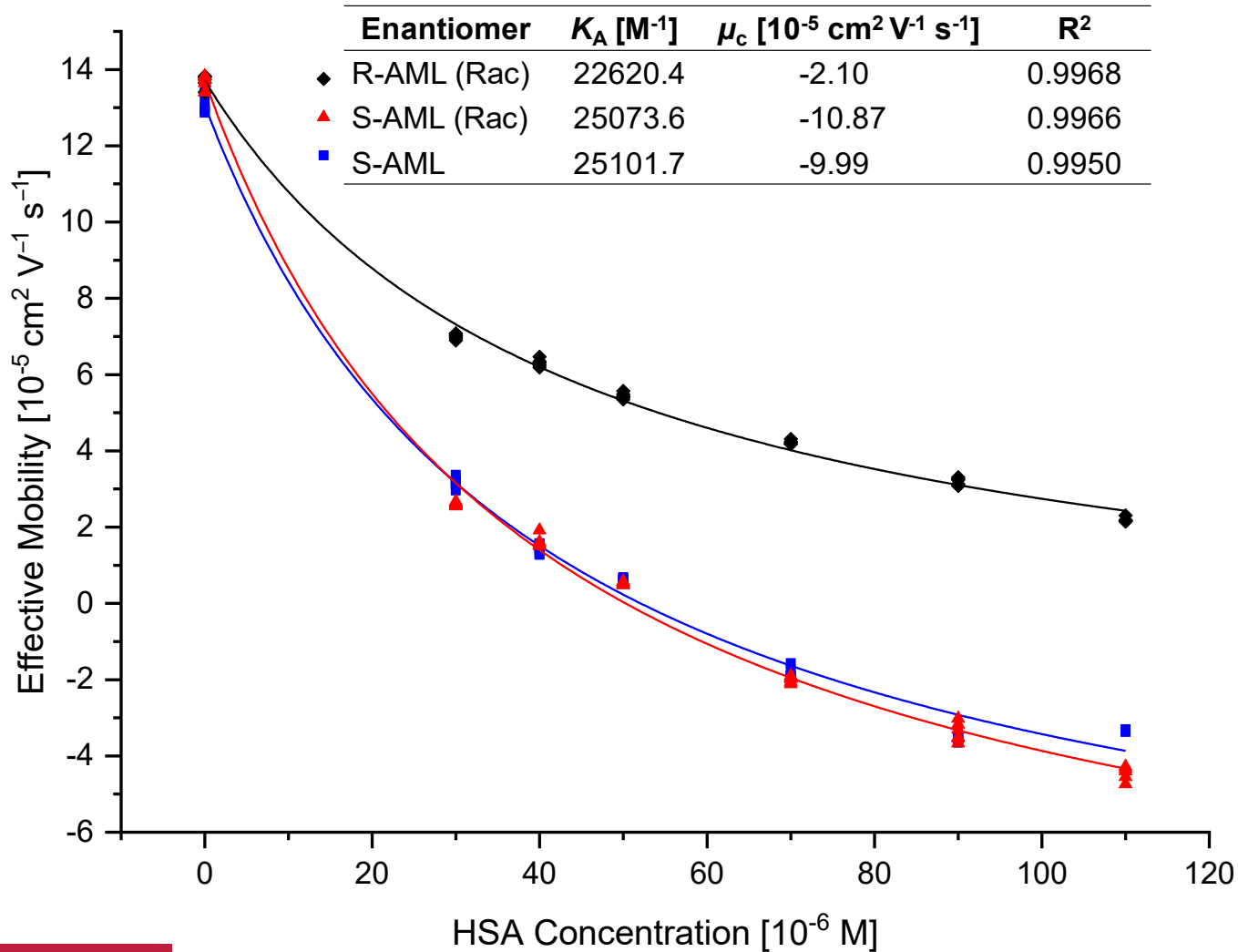
Visualization of the mobility shift-ACE system



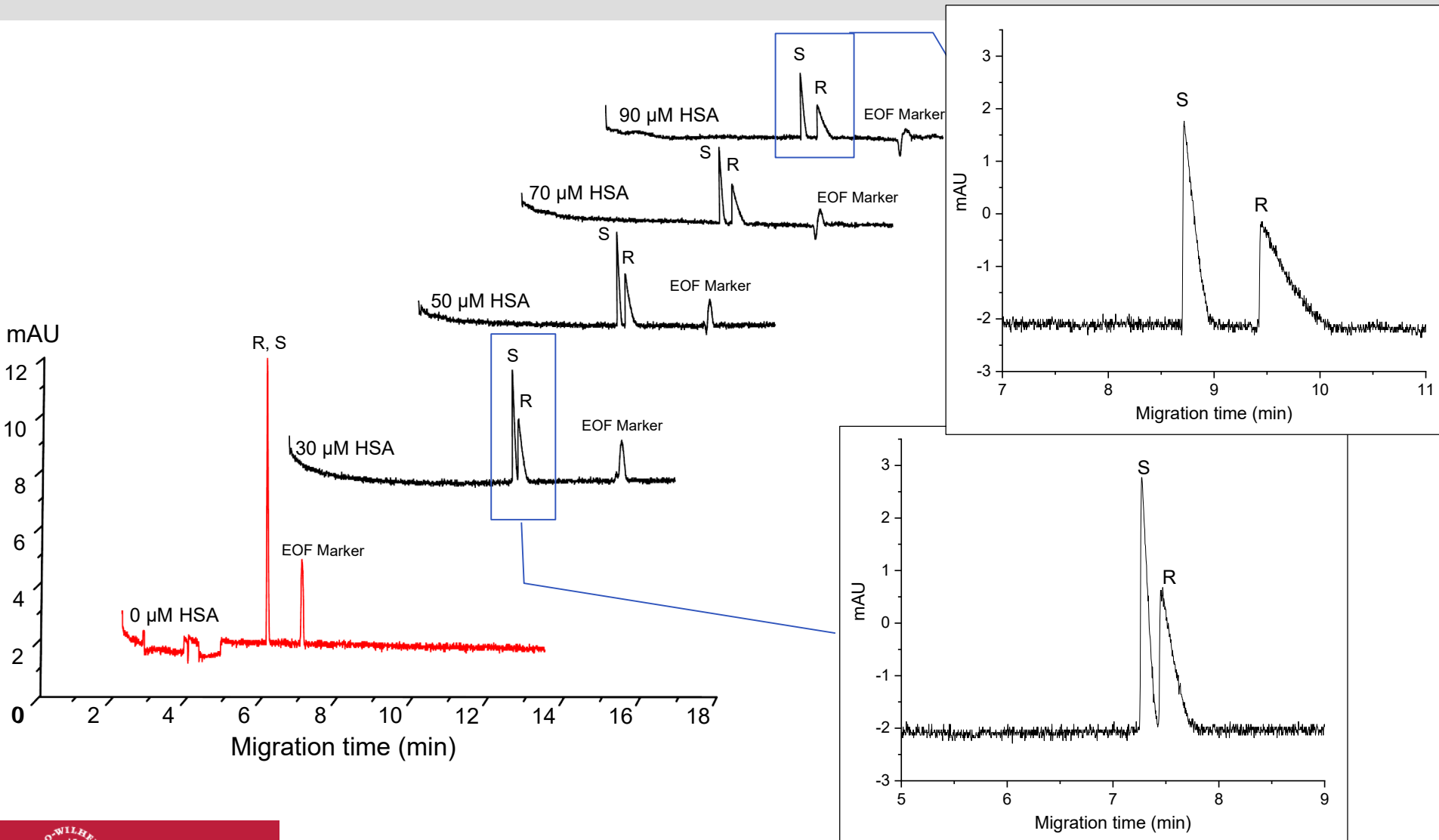
Amlodipine



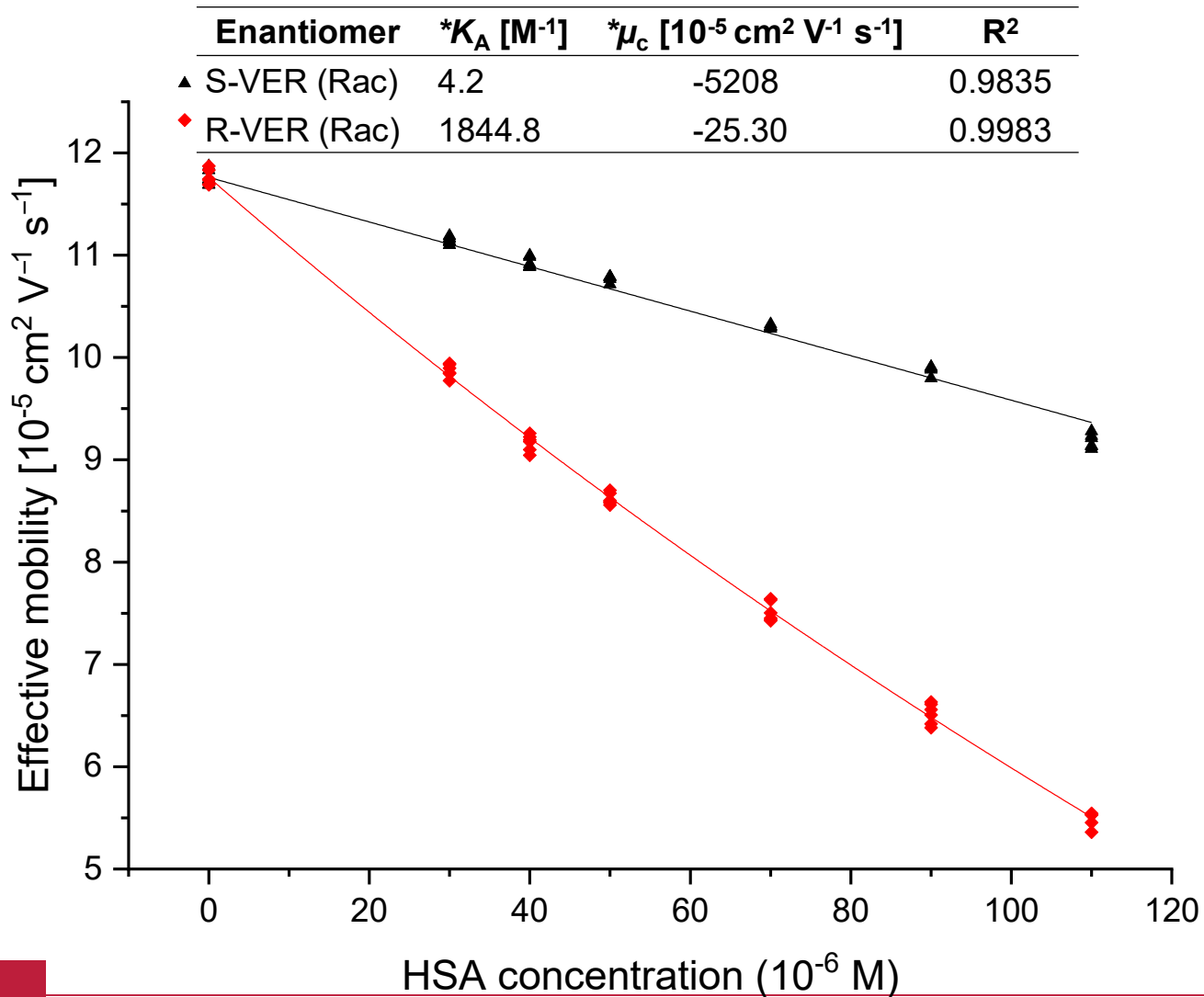
Binding curve of Amlodipine



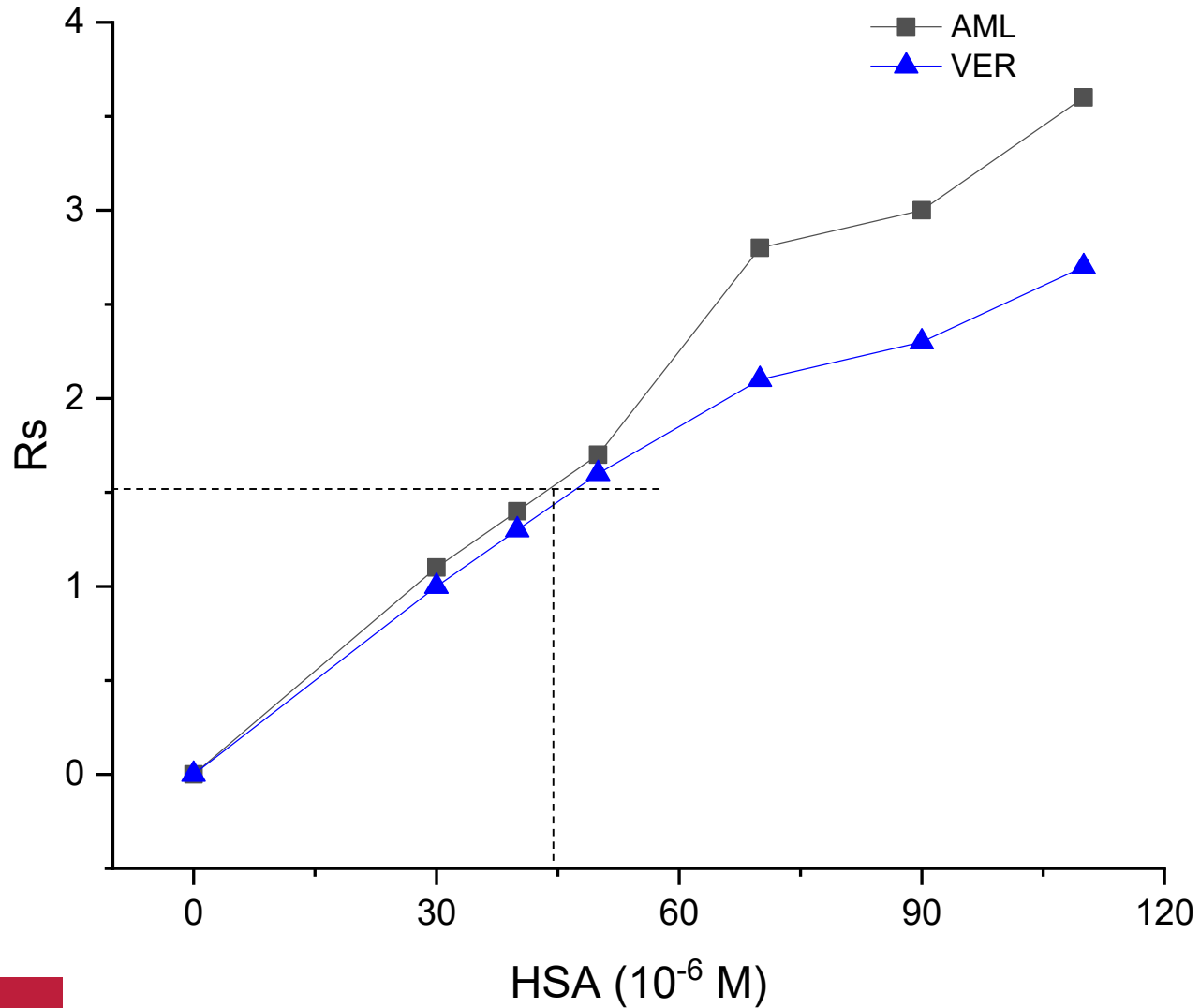
Verapamil



Binding curve of Verapamil



Enantiomers resolution



Conclusions

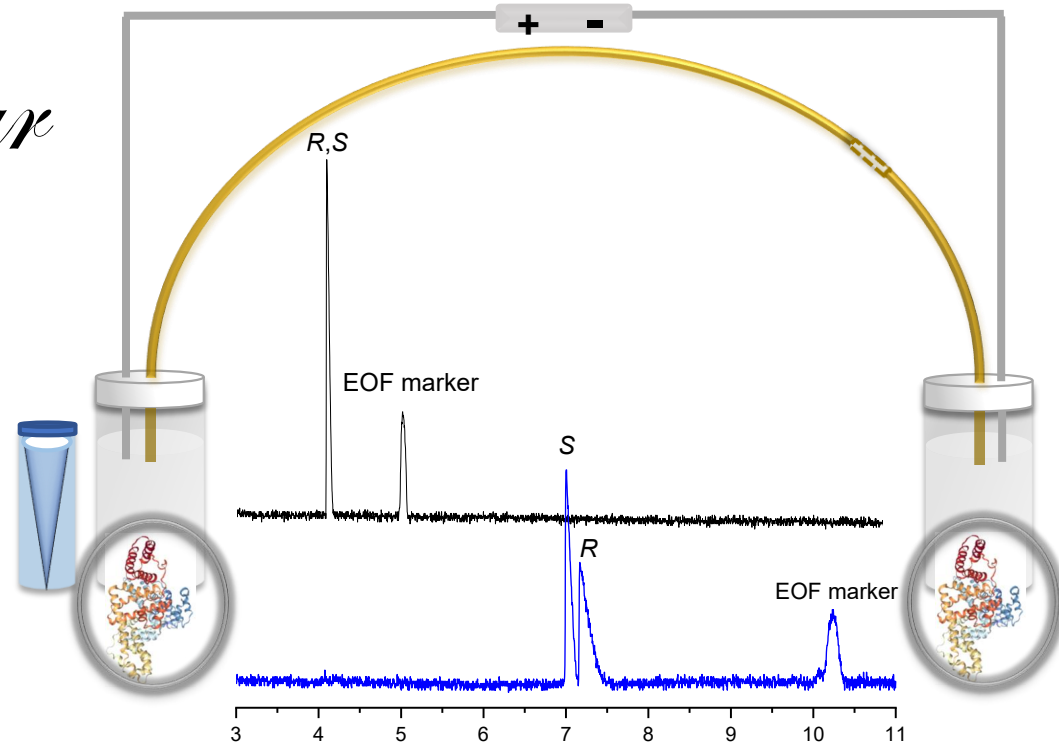
- Maltodextrin and HSA exhibit enantioselectivity as chiral selectors for both Ca^{2+} -channel blockers by direct chiral-CE .
- The enantiomers of AML and VER are resolved as the result of the stereoselective interaction with the chiral selectors.
- AML enantiomeric separation was induced by a high conc. of maltodextrin, a low BGE pH and a low applied voltage. MD showed the highest influence on the resolution.
- Mobility shift-ACE has proved as a powerful technique for simultaneous drug-protein interactions study, including chiral separation and binding constants determination.
- Positively charged substances seem to be the most suitable models to predict the K_D or K_A value in the presence of HSA as a negatively charged CS at physiological pH.

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*Thank you for your
attention!*



Mobility Shift-ACE proved to be a valuable approach *for ...*

■ Chiral separation

■ Binding constant determination