ILHEM-FAIZA HAKEM (Curriculum Vitae)

Affiliation	Department of Materials Science and Engineering, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA, 15213.
Current position	Research Associate
Phone and e-mail	(412) 592-3622; hakemif@cmu.edu

Education

Ph.D (Doctorat d'Etat Es Sciences) in Physics.
Thesis title: "Static and Dynamic Properties of Neutral and Charged Polymer Mixtures in Solution"
Abou Bekr Belkaid University (UAB), Faculty of Sciences, Physics Department, Tlemcen, Algeria
Master in Physics.
Thesis title: "Structure Factors and Correlation Functions of Polyelectrolyte Solutions"
Abou Bekr Belkaid University (UAB), Faculty of Sciences, Physics Department
Tlemcen, Algeria
Diploma of Advanced Studies in Physics
Abou Bekr Belkaid University (UAB), Faculty of Sciences, Physics Department
Tlemcen, Algeria

Awards/Honors/Fellowships

2005-2008	PI of the research project "Engineering Opportunities of Metamaterials and Mixtures of Hydrosoluble Polymers". CNEPRU, D1301/53/05 (National Commission for the Evaluation of the University Research Proposals), Algeria
2003	ORNL-SENSE scholarship, USA
02/2001-08/2001 2002 07/2003-01/2004	Visiting Scientist fellowship, Argonne National Laboratory, USA
1998-2000	German Science Foundation fellowship, Germany
1994-1998	Co-PI of the research project "Synthesis, Characterization and Study of Physico-chemical Properties of Polymers", CNEPRU, E1329/03/94, Algeria
1996, 1997	CNRS fellowship (National Center of Scientific Research), France
1995-1997	PI of the research project "Theory and Simulation of Polymers", CNEPRU, E1301/05/95, Algeria
1987-1994	Member of the Franco-Algerian research project "Creation of a Laboratory for the synthesis, characterization and study of polymers", CMEP (Joint Committee of Evaluation and Planning, 87MES/62)

Professional Affiliations

American Physical Society (APS)
American Chemical Society (ACS)

Professional Activities and Affiliations

09/2011-present — ***Research Associate***
Carnegie Mellon University, Department of Materials Science and Engineering, Pittsburgh, USA

12/2003-present (on leave) — ***Professor***
Abou Bekr Belkaid University (UAB), Faculty of Sciences, Physics Department, Tlemcen, Algeria

07/2005-08/2011 — ***Visiting Professor***
Carnegie Mellon University, Department of Materials Science and Engineering, Pittsburgh, USA

09/1997-12/2003 — ***Associate Professor***
Abou Bekr Belkaid University (UAB), Faculty of Sciences, Physics Department, Tlemcen, Algeria

02/2001-08/2001
2002
07/2003-01/2004 — ***Visiting Professor***
Research on "*Effect of Ion Binding on Structure and Properties of Neutral Polymers in Electrolyte Solutions*"
Argonne National Laboratory, IPNS, Argonne, USA

1998-2000 — ***Visiting Professor***
Research on "*Relaxation Modes in Polymeric Salt Solutions and Adsorption of Hydrophobic Polyelectrolytes onto Oppositely Charged Surfaces*"
Max-Planck Institute for Polymer Research, Mainz, Germany

1989,1996-2000 (short-term visits) — ***Visiting Scientist***
Research on "Static and Dynamic Scattering of Polymer Solutions and *Relaxation Modes in Polymeric Salt Solutions*
Institut Charles Sadron (ICS), Strasbourg, France

09/1991-09/1997 — ***Assistant Professor***
Abou Bekr Belkaid University (UAB), Faculty of Sciences, Physics Department, Tlemcen, Algeria

Activities

2012 — Session presider for the 243 American Chemical Society National Meeting, Division of Colloid and Surface Chemistry, Session "Novel Surface Science Techniques Probing Solid-Liquid and Biological Interfaces", San Diego

2010 — Session presider for the 240 American Chemical Society National Meeting, Division of Inorganic Chemistry, Session "NanoScience", Boston

2011-2013	Judge for the Sigma Xi poster competition at Carnegie Mellon University
2010 & 2011	Reviewer of the research project proposals for the Czech Science Foundation
2000-present	Reviewer for Journal of Chemical Physics, Journal of Biomaterials and Nanotechnology.
1991-2000	Symposium organizer in Algeria for the First Mediterranean Symposium on Polymers, 4th Congress of the Algerian Chemical Society.
1997-2005	Member of the scientific committee, Physics Department, Science Faculty, Tlemcen University, Algeria
1991-2005	Member of the pedagogic committee, Physics Department, Science Faculty, Tlemcen University, Algeria

Student Supervision

2011-present Rachel Ferebee	"Block Copolymer/PEGylated Enzymes Materials: Theoretical & Experimental Investigation" Carnegie Mellon University, Department of Materials Science and Engineering, USA
2010 Caroline Multari	"Integrating Enzymes into Block Copolymer Nanocomposites" Carnegie Mellon University, Department of Materials Science and Engineering, USA
2010 Ethan Ungchusri	"Solubility Properties of PEGylated Enzymes" Carnegie Mellon University, Department of Materials Science and Engineering, USA
2009 Melissa Lackey	"Polymers in Ionic Liquid Solvents - Static and Dynamic Light Scattering" Carnegie Mellon University, Department of Materials Science and Engineering, USA
2009 Katie Bastine	"Static and Dynamic Light Scattering of Proteins and PEGylated-Proteins Solutions" Carnegie Mellon University, Department of Materials Science and Engineering, USA
2003-2005 Benhamou Med	"Solubility of Poly(ethylene oxide) as Function of Temperature and Pressure" Abou Bekr Belkaid University (UAB), Science Faculty, Physics Department, Algeria
2001-2003 Fliti Khalida	"Polymers at Interfaces: Investigation of Block Copolymer/Nanoparticle Composite Materials" Abou Bekr Belkaid University (UAB), Science Faculty, Physics Department, Algeria
2001-2003 Soulimane Sofiane	"Polymers at Interfaces: Stretching of a Hydrophobic and Weakly Charged Polyelectrolyte Chain" Abou Bekr Belkaid University (UAB), Science Faculty, Physics Department, Algeria
1998-2000 Bouzina Lila	"Static Properties of Mixtures of Block Copolymer/Homopolymer Blend Solutions" Abou Bekr Belkaid University (UAB), Science Faculty, Physics Department, Algeria

Invited Talks

1. Hakem IF.; Leech, A.; Bohn, J.; Walker J.; Bockstaller, MR. "Analysis of graft compositions in surface modified nanoparticles". 243 American Chemical Society National Meeting, Division

of Colloid and Surface Chemistry, Session "Novel Surface Science Techniques Probing Solid-Liquid and Biological Interfaces", San Diego, CA, March, 25-29, 2012

2. Hakem IF.; Leech, A.; Bohn, J.; Walker J.; Bockstaller, MR. "Understanding ligand distribution in surface-modified particle-like systems: theory versus experiments". Abou Bekr Belkaid University (UAB), Faculty of Sciences, Physics Department, Tlemcen, Algeria, June 7th, 2011

3. Hakem, IF; Walker, J; Leech, A; Johnson, J; Donahue, S; Bockstaller, MR. "Experimental and theoretical evaluation of the distribution of functionality of surface modified nanoparticles". 240 American Chemical Society National Meeting, Division of Inorganic Chemistry, Session "NanoScience", Boston, MA. August 22-26, 2011

4. Bockstaller MR.; Hakem IF.; Walker J. "Role of Heterogeneity on the Activity of Functionalized Enzyme Systems". BUCT Biotechnology Conference, Beijing, China, Aug 8th, 2011

Regular Talks and Posters

1. Bockstaller MR.; Hakem IF.;Walker J. "Experimental and theoretical evaluation of ligand distribution in surface-modified nanoparticle systems". 242 American Chemical Society National Meeting, Division of Colloid and Surface Chemistry, Session "Novel Surface Science Techniques Probing Solid-Liquid and Biological Interfaces", Denver, CO. Aug28th-Sep1st, 2011

2. Bockstaller MR.; Hakem IF.; Leech A; Bohn, J.;Walker J. "Understanding ligand distribu tions in modified particle and particle-like systems". 241 American Chemical Society National Meeting, Division of Colloid and Surface Chemistry, Session "Theory and Modeling of the Individual and Collective Properties of Nanoparticles", Anaheim, CA, 2011

3. Hakem IF.; Lal J.; Bockstaller MR. "Relevance of Solvent Characteristics on Ion Binding and the Structure Formation of Neutral Polymers in Electrolyte Solutions"
American Physical Society Meeting (APS), Marriot Waterfront, Baltimore, MD, USA, 2006

4. Hakem IF. "Binding of Monovalent Ions to PEO in Solution -- Relevant Parameters and Structural Transitions", January 2004, Argonne National Laboratory, Argonne, USA

5. Hakem IF.; Lal J. "Polyelectrolyte-like behaviour of poly(ethylene-oxide) solutions with added monovalent salt". NSF-CHEMBIO Workshop, Neutron Scattering for Chemistry and the Chemistry/Biology Interface, Florida State University, Tallahassee, FL, USA, September, 23-25, 2003

6. Hakem IF. "Neutron Scattering Results: PEO in different Solutions", 2003, Argonne National Laboratory, Argonne, USA

7. Fliti Kh.; Senoudi AR.; Hakem IF.; Bockstaller MR. "Organization of enthalipcally compatibilized nanocrystals in block copolymer/nanocrystal blends". NSFCHEMBIO Workshop, Neutron Scattering for Chemistry and the Chemistry/Biology Interface, Florida State University, Tallahassee, FL, USA, September, 23-25, 2003

8. Hakem IF.; Bockstaller MR. "Thermodynamics of Multicomponent Block Copolymer/ Nanocrystal Composite Material". Annual ORNL Workshop on Applications of Neutron Scattering, Tallahassee, FL, USA, September, 23-25, 2003

9. Hakem IF. "Polyelectrolyte-Like Behavior of PEO Solutions With Added Monovalent Salt", October 2002, Argonne National Laboratory, Argonne, USA

10. Bouzina L.; Hakem IF. "Macrophase versus Microphase Separation of Homopolymers and Copolymers in Solution". Vème JOURNEES D'ETUDES SUR LES POLYMERES, Plastics and Rubber Engineering Department. Boumerdès, Algeria, April 22-24, 2002

11. Hakem IF.; Lal J. "Solution Behavior Of Polyethylene Oxide in Methanol as Function Of Temperature, Concentration and Salt". Principles of Soft Matter, Santa-Fe, USA, May, 21-25, 2001

12. Hakem IF.; Lal J. "Solvent dependent complexation in non-ionic Polymer/salt systems". International Conference on Neutron Scattering (ICNS), Munich, Germany, September 9-13, 2001

13. Hakem IF.; Borisov O.; Vilgis TA.; Johner A; Joanny JF. "Adsorption of a polyelectrolyte globule onto an oppositely charged surface". Chains@Interfaces 2001, A Euro Conference on the Physics of Surfactants and Polymers at Interfaces, Evora, Portugal, January, 14-19, 2001

14. Bouzina L.; Hakem IF. "Adsorption of hydrophobic polyelectrolytes onto oppositely charged surfaces". Participation au Congrès Euro-Méditerranéen de la matière condensée, Tlemcen, Algeria, June, 14-16, 2001

15. Bouzina L.; Hakem IF., "Caractérisation Statique du Mélange Quaternaire Poly(Styrène-co-diméthylsiloxane)/Polyméthylméthacrylate/Toluène". Participation aux 4ème Journées d'études sur les polymères JEP 2000, Taghit, Algeria, May, 02-04, 2000

16. Hakem IF.; Vilgis TA.; Johner A.; Joanny JF. "Slow Plasmon Modes in Polymeric Salts" Polyelectrolytes 2000, Les Diablerets, Switzerland, July, 1-5, 2000

17. Hakem IF. "Adsorption of hydrophobic Polyelectrolytes onto Oppositely charged Surfaces", December 2000, Max-Planck Institut für Polymerforschung, MPIP, Germany

18. Hakem IF. "Polysalts: Static and Dynamic Properties", December 2000, Max-Planck Institute for Polymer Research, MPIP, Germany.

19. Hakem IF. "Polymeric Salts", May 1999, Max-Planck Institute for Polymer Research, MPIP, Germany.

20. Hakem IF.; Vilgis TA. "Polysalts: Static and Dynamic Properties". Naurod, Germany, May 10-12, 1999

21. Hakem IF.; Vilgis TA. "Analytic Theory of Static and Dynamic Properties of Polyelec trolytes in Solution: Polyelectrolytes with Complex Architecture and Behavior on Surfaces", Naurod, Germany, December, 1999

22. Bouzina L.; Hakem IF. "Paramètre d'interaction Apparent du mélange quaternaire: Copolymère/ Homopolymère / Solvant". Congrès De La Société Algérienne De Chimie. Oran, Algeria, May, 12-15, 1999

23. Bouzina L.; Hakem IF. "Etude du Paramètre d' Interac tion Apparent d'une Solution Quaternaire consti tuée d'un Copolymère, d'un Homopoly mère et d'un Solvant". Participation aux travaux du 3ème Congrès CNPA, Institut de Physique, Université d'Oran Es-Sénia, Algeria, October, 10-12, 1998

24. Hakem IF. "Participation au Congres International sur les Polymères Associatifs à Fontevrault, France, November, 1997

25. Hakem IF.; Benmouna M. "Second coefficient du viriel dans un mélange ternaire polymère/solvant1/solvant2". Congrès De La Société Algérienne De Chimie; Tlemcen, Algeria, May, 13-15, 1997

26. Benmouna M.; Vilgis TA.; Hakem IF. "Scattering from Multicomponent Polymer Solutions". 5ème Journées Maghrébines sur les Sciences des Matériaux, Hammamet, Tunisia, November 8-10, 1996

27. Benmouna M.; T.A. Vilgis TA.; Hakem IF. "Static Scattering from Weakly Polyelectrolyte Solutions". Polyelectrolytes Potsdam' 95. First International Symposium On Polyelectrolytes and International Bunsen-Discussion-Meeting. Polyelectrolytes in Solution and at Interfaces, Potsdam, Germany, September 18-22, 1995

28. Benmouna M.; Vilgis TA.; Hakem IF.; Negadi A. "Statique et Dynamique des Mélanges de Polymères faiblement chargés". 1er Congrès De La Société Algérienne De Chimie, Oran, Algeria, May 13-16, 1991

29. Benmouna M.; Vilgis TA.; Hakem IF.; Negadi A. "Static Scattering from Mixtures of Weakly Charged Polymers". First Mediterranean Symposium On Polymers, Tlemcen, Algeria, April 25-29, 1991

30. Benmouna M.; Vilgis TA.; Hakem IF. "Dynamic Scattering from Mixtures of Weakly Charged Polymers". First Mediterranean Symposium On Polymers, Tlemcen, Algeria, April 25-29, 1991

31. Benmouna M.; Vilgis TA.; Hakem IF. "Static and Dynamic Scattering Properties from Charged Copolymers in solution". First Mediterranean Symposium On Polymers, Tlemcen, Algeria, April 25-29, 1991

Publications and Abstracts (h-index: 8)

1. Hakem IF.; Leech AM.; Bohn J.; Walker JP.; Bockstaller MR. "Analysis of Heterogeneity in Non-Specific PEGylation Reactions of Biomolecules".
Biopolymers, Volume: 99, 427, 2013.

2. A Benmouna, R Benmouna, MR Bockstaller, IF Hakem. "Self-Organization Schemes towards Thermodynamic Stable Bulk Heterojunction Morphologies: A Perspective on Future Fabrication Strategies of Polymer Photovoltaic Architectures".
Advances in Physical Chemistry 2013

3. Bockstaller MR.; Hakem IF.; Walker J. "Experimental and Theoretical Evaluation of Ligand Distributions in Surface-Modified Nanoparticle Systems".
Abstracts of papers of the American chemical society, Volume: 242, Meeting Abstract: 413-COLL, Published: AUG 28 2011.

4. Hakem IF.; Leech AM.; Johnson JD.; Donahue SJ.; Walker JP.; Bockstaller MR. "Understanding Ligand Distributions in Modified Particle and Particle-like Systems".
Journal of the American Chemical Society, Volume: 132 Issue: 46, Pages: 16593-16598, Published: NOV 24 2010.
Times Cited: 8

5. Hakem IF.; Walker J.; Leech A.; Bockstaller MR. "Experimental and Theoretical Evaluation of

the Distribution of Functionality of Surface Modified Nanoparticles".
Abstracts of papers of the American chemical society, Volume: 240, Meeting Abstract: 624-INOR Published: AUG 22 2010.

6. Listak J.; Hakem IF.; Ryu Hyung J.; Rangou S.; Politakos N.; Misichronis K.; Avgeropoulos A.; Bockstaller MR. "Effect of Chain Architecture on the Compatibility of Block Copolymer/Nanoparticle Blends".
Macromolecules, Volume: 42, Issue: 15, Pages: 5766-5773, Published: AUG 11 2009.
Times Cited: 14

7. J Listak, HJ Ryu, IF Hakem, R Sofia, P Nikolaos, M Konstantinos, M. R. Bockstaller "Effect of Chain Architecture on Nanoparticle Miscibility in Block Copolymer Nanocomposites" Bulletin of the American Physical Society 54, 2009

8. Hakem IF.; Boussaid A.; Benchouk-Taleb H.; Bockstaller MR. "Temperature, Pressure, and Isotope Effects on the Structure and Properties of Liquid Water: A Lattice Approach".
Journal of chemical physics, Volume: 127, Issue: 22, Article Number: 224106. Published: DEC 14 2007.
Times Cited: 13

9. Hakem IF.; Lal J.; Bockstaller MR. "Mixed Solvent Effect on Lithium-Coordination to Poly(ethylene oxide)".
Journal of polymer science Part B-polymer physics, Volume: 44, Issue: 24, Pages: 3642-3650. Published: DEC 15 2006.
Times Cited: 5

10. IF Hakem, J Lal, M Bockstaller. "Relevance of Solvent Characteristics on Ion-Binding and the Structure Formation of Neutral Polymers in Electrolyte Solutions", Bulletin of the American Physical Society, 2006

11. Hakem IF.; Lal J; Bockstaller MR. "Binding of Monovalent Ions to PEO in Solution: Relevant Parameters and Structural Transitions".
Macromolecules, Volume: 37, Issue: 22, Pages: 8431-8440. Published: NOV 2 2004.
Times Cited: 23

12. Lal J.; Hakem IF. "Unusual Behavior of Poly(ethylene-oxide) in Aqueous Mixtures".
European physical journal E, Volume: 15, Issue: 2, Pages: 217-223. Published: OCT 2004.
Times Cited: 10

13. Hakem IF.; Lal J. "Scientific Review: Interactions of PEO with Monovalent Electrolytes in Solvents of Different Hydrogen Bonding Capacities".
Neutron News, Volume 15, Issue 3, July 2004, pages 27-31.

14. Benmouna M; Hakem IF.; Negadi A.; Vilgis TA.; Duval M.; Benoit H. "Polymers and Mixed Solvents".
Algerian Journal of Advanced Materials, 2, 41, 2004

15. J Lal, IF Hakem. "Polyelectrolyte-like behaviour of poly (ethylene-oxide) solutions with added monovalent salt"
APS Meeting Abstracts 1, 30007, 2004

16. IF Hakem, J Lal, E Lang. "Interactions of PEO with monovalent electrolytes in solvents of different hydrogen bonding capacities"
Neutron News 15 (3), 2004

17. Hakem IF.; Lal J. "Polyelectrolyte-like Behavior of Poly(ethylene-oxide) Solutions with Added Monovalent Salt".
Europhysics letters, Volume: 64, Issue: 2, Pages: 204-210. Published: OCT 2003.
Times Cited: 13

18. Hakem IF.; Lal J. "Evidence of Solvent-Dependent Complexation in Non-Ionic Polymer-Salt Systems".
Applied physics A-Materials science & processing, Volume: 74, Supplement: S, Pages: S531-S53, Part: Part 1, Published: DEC 2002.
Times Cited: 3

19. Borisov OV.; Hakem IF.; Vilgis TA.; Johner A.; Joanny JF. "Adsorption of Hydrophobic Polyelectrolytes onto Oppositely Charged Surfaces".
European physical journal E, Volume: 6, Issue: 1. Pages: 37-47. Published: SEP 2001.
Times Cited: 26

20. Hakem IF.; Johner A.; Vilgis T.A. "Slow Plasmon Modes in Polymeric Salt Solutions".
Europhysics letters, Volume: 51, Issue: 6, Pages: 608-613. Published: SEP 2000.
Times Cited: 4

21. Hakem IF.; Johner A.; Joanny JF. "Polymeric Salts: Static and Dynamic Debye-Huckel Theory".
Macromolecules, Volume: 31, Issue: 23, Pages: 8305-8311. Published: NOV 17 1998.
Times Cited: 4

22. Benmouna M.; Hakem FI.; Vilgis T.A. "Static Scattering from Multicomponent Polyelectrolyte Solutions".
Berichte der Bunsen-gesellschaft fuer physikalische Chemie, Volume: 100, Issue: 6, Pages: 815-820. Published: JUN 1996.
Times Cited: 2

23. Benmouna M.; Hakem FI.; Vilgis TA. "Partial Structure Factors of Polyelectrolytes"
Comptes rendus de l'academie des sciences serie II fascicule B-mecanique physique chimie astronomie, Volume: 322, Issue: 3, Pages: 219-222. Published: FEB 1 1996.
Times Cited: 0

24. Benmouna M.; Duval M.; Strazielle C.; Benoit H.; Hakem IF. "Static and Dynamic Light Scattering from Multicomponent Polymer Mixtures PS/PDMS/ PMMA/toluene".
Acta polymerica, Volume: 47, Issue: 1, Pages: 29-34. Published: JAN 1996.
Times Cited: 1

25. Benmouna M.; Duval M.; Strazielle C.; Benoit H.; Hakem IF. "Theory of Static Scattering from Polymer Mixtures – The Case of PS/PDMS/PMMA/Toluene".
Macromolecular Theory and Simulations, Volume: 4, Issue: 1, Pages: 53-65. Published: JAN 1995.
Times Cited: 2

26. Benmouna M.; Vilgis TA.; Hakem IF. "Dynamic Scattering from Mixtures of Weakly Charged Polymers".

Macromolecules, Volume: 25, Issue: 3, Pages: 1144-1152. Published: FEB 3 1992.
Times Cited: 7

27. Benmouna M.; Vilgis TA.; Hakem IF.; Negadi A. "Static Scattering from Mixtures of Weakly Charged Polymers".
Macromolecules, Volume: 24, Issue: 24, Pages: 6418-6425. Published: NOV 25 1991.
Times Cited: 17

Research Interests

My research interests extend to both the theoretical understanding of soft multicomponent materials as well as the application of advanced scattering and spectroscopic techniques to understand structure-property relations in polymeric and biological derived nanostructured materials. My current research areas focuses on:

- The application of random phase approximation and scaling theory to polymer mixtures and polyelectrolytes in solutions (charging of neutral polymers via added salts); statistical mechanics of associating polymers and hydrogen-bonded liquids; as well as thermodynamic modeling of complex polymer, biopolymer and nanoparticle blend systems.

- The characterization of synthetic and bio-derived multicomponent materials using static and dynamic scattering (neutron, X-ray and light) as well as electron imaging techniques. I also explore the use of mass spectrometry (MALDI-TOF) and vibrational spectroscopy (FTIR) to understand the structure and activity relations in enzyme-conjugate systems.

Teaching Experience:

- General Physics
- Statistical Mechanics
- Introduction to Quantum Mechanics
- Physical Chemistry of Macromolecules
- Polymer Physics