

# Mahmoud Al-Hussein

Full Professor of Physics

Physics Department

The University of Jordan

Amman 11942, Jordan

Email: [m.alhussein@ju.edu.jo](mailto:m.alhussein@ju.edu.jo)

Nationality: Jordanian

Phone: +962 (0)6 5355000 ext. 22053

Mobile: +962 796663033

Fax: +962 (0)6 5348932

<http://scholar.google.com/citations?user=9g-QAIIAAAAJ&hl=en>

[https://www.researchgate.net/profile/Mahmoud\\_Al-Hussein?ev=hdr\\_xprf](https://www.researchgate.net/profile/Mahmoud_Al-Hussein?ev=hdr_xprf)

## Education

Oct. 1996 to Jan. 2000 to Interdisciplinary Research Centre (IRC) of Polymer Science and Technology,  
Department of Physics, University of Leeds, Leeds, UK

### **Ph.D. in Polymer Physics**

“Mechanical Behaviour of Oriented Polyethylenes”

Supervised by Professors I. M. Ward and G. R. Davies

Sep. 1992 to June 1995 to Department of Physics, The University of Jordan,  
Amman, Jordan

### **M.Sc. in Physics**

“Photoacoustic Spectroscopy of Multilayered Samples by Front Illumination”.

Supervised by Professor I. S. Shahin

Sep. 1988 to June 1992 to Department of Physics, Yarmouk University,  
Irbid, Jordan

### **B.Sc. in Physics**

Sep. 1987 to June 1988 to Irbid Secondary School,  
Irbid, Jordan

**High School Diploma** (AGP: 88.8%)

## Work Experience

Sep. 2015 to Present to **Full Professor:** Physics Department, The University of Jordan, Amman, Jordan.

Sep. 2013 to Sep. 2014 to **Visiting Professor:** Leibniz Institute of Polymer Research Dresden, Dresden, Germany.

Sep. 2011 to Sep. 2015 to **Associate Professor:** Physics Department, The University of Jordan, Amman, Jordan.

July 2010 to Sep. 2012 to **Assistant Dean for Development Affairs:** Faculty of Science, The University of Jordan, Amman, Jordan.

Sep. 2005 to Sep. 2011 to **Assistant Professor:** Physics Department, The University of Jordan, Amman, Jordan.

Oct. 2002 to **Research Fellow:** Preparing and investigating nanostructures using self-

- Jan 2005 assembled polymeric materials. FOM-Institute for Atomic and Molecular Physics, Amsterdam, **The Netherlands**.
- Jan. 2000 to Sep. 2002 **Research Fellow:** Investigating the structure formation mechanisms in semicrystalline polymers from the melt and glassy states. Fakultät für Physik, University of Freiburg, **Germany**.
- Jan. 2001 to Sep. 2002 **Tutor:** Taught and coordinated tutorial classes of the condensed matter physics course for second year physics students. Taught, demonstrated and assessed practical experiments in the Fakultät für Physik, University of Freiburg.
- Oct. 1996 to Sep. 1999 **Teaching Assistant:** Taught tutorial classes for first year physics students in the physics department, University of Leeds. Taught, demonstrated and assessed practical experiments in the second year laboratory, which also included evaluating oral presentations.

## Awards & Fellowships

- June 2015 to Sep. 2015 Visiting Professor, Leibniz Institute of Polymer Research Dresden, Dresden, Germany.
- June 2012 to Sep. 2012 Visiting scientist, Physics Department, TU München, Germany. Grant provided by the Erasmus Mundus Mamaself Project.
- June 2011 to Sep. 2011 Visiting scientist, Physics Department, TU München, Germany. Grant provided by the TU München, Physik Department.
- June 2009 to Sep. 2009 Visiting scientist, Physics Department, LMU, Germany. Grant provided by the DFG
- Feb. 2008 to Sep. 2008 Fellowship provided by the IAEA spent at the Physics Department , TU München, Germany.
- Oct. 1996 to Sep. 1999 Partial scholarship from the Physics Department, University of Leeds.
- Oct. 1996 to Sep. 1999 Partial scholarship from the Arab-British Charitable Foundation.

## Research Interests

- Nanostructured materials and patterned surfaces using self-assembling polymeric systems
- Organic solar cells
- Proton exchange membranes
- Order in thin films and grazing-incidence X-ray scattering techniques using synchrotron radiation
- Structural formation mechanisms, tensile deformation mechanisms, mechanical properties, and stability of semicrystalline polymers

## Taught Courses

Undergraduate	Graduate
• Solid state physics	• Advanced solid state physics
• Materials physics	• Properties of materials
• Polymer physics	

<ul style="list-style-type: none"> <li>• Modern physics</li> </ul>	
<ul style="list-style-type: none"> <li>• Various general physics courses and their labs</li> </ul>	

## Graduate Students Supervision

- Supervisor of M.Sc. student Razzan Al-Esseili, University of Jordan: Thesis Title: "**Preparation and investigation of bulk heterojunction organic solar cells**", 2015–.
- Co-supervisor of Ph.D student Eman Hwaitat, University of Jordan: Thesis Title: "**Fabrication and characterization of powder and thin films of Z-type Hexaferrites**", 2015–.
- Supervisor of M.Sc. student Hasan Aideh, University of Jordan: Thesis Title: "**Conductivity measurements of sulfonated polyimides proton exchange membranes**", 2015–.
- Supervisor of M.Sc. student Ghada Al-Madani, University of Jordan: Thesis Title: "**Development of test system for hydrogen proton exchange membrane fuel cells**", 2011–2012.
- Supervisor of M.Sc. student Maysam El-Balbisi, University of Jordan: Thesis Title: "**Preparing nanostructures using diblock copolymers**", 2010–2011.

## Under Graduate Students Supervision

- Thesis Advisor and supervisor of B.Sc. students Anisah Haswa and Isra Abukhadeja, University of Jordan: Thesis Title: "**Preparation of super hydrophobic polymer coating**", 2011.
- Thesis Advisor and supervisor of B.Sc. student Asma' Al-Suradi, University of Jordan: Thesis Title: "**Characterization of fluorinated liquid crystal/amorphous diblock copolymer thin films**", 2012.
- Thesis Advisor and supervisor of B.Sc. student Issa Al-Khateeb, University of Jordan: Thesis Title: "**Structural investigation of sulfonated polyimide proton exchange membranes**", 2013.
- Thesis Advisor and supervisor of B.Sc. student Issa Machamreh, University of Jordan: Thesis Title: "**Ionic conductivity measurements of sulfonated polyimide proton exchange membranes**", 2013.

## Reviewing

- Polymer Bulletin, Springer
- Molecules, MDPI AG
- Polymer Chemistry, RSC Publishing
- Macromolecular Rapid Communications, WILEY-VCH Verlag GmbH & Co. KGaA,
- Journal of Polymer Engineering, De Gruyter
- Dirasat, University of Jordan, Deanship of Academic Research
- Jordan Journal of Physics
- The Jordan Scientific Research Fund
- The Palestine Scientific Research Fund

## Areas of Expertise

Soft condensed matter and nanoscale self-assembly, Nanopatterned surfaces, Organic solar cells, Ordering in thin films: X-ray reflectivity, Grazing incidence X-ray scattering (GISAXS and GIWAXS) using synchrotron radiation, Small and wide angle X-ray scattering, Atomic Force Microscopy (AFM), Optical light microscopy, Electrochemical impedance spectroscopy, Preparing, Characterising and composite modelling of oriented semicrystalline polymers, Differential scanning calorimetry (DSC), Creep and stress relaxation measurements, Dynamic tensile and shear measurements, Experience in teaching Physics and Material science courses, Spoken languages: **Arabic** (mother language), **English** (excellent verbal and writing skills), **German** (good verbal skills), **Dutch** (basic knowledge).

## Referees

- Professor G. Strobl, Institute of Physics, Faculty of Mathematics and Physics, Albert-Ludwig-University of Freiburg, Hermann-Herder-Str. 3, 79104 Freiburg, Germany, Tel.: +49 761 203 97777 Fax: +49 761 203 5855, Email: strobl@uni-freiburg.de
- Professor Manfred Stamm, Leibniz Institute of Polymer Research Dresden, Hohe Strasse 6, 01069, Dresden, Germany, Tel:+49 (0)351 4658 225, Fax: +49 (0)351 4658 281, Email: stamm@ipfdd.de
- Professor Wim H. de Jeu, DWI – Leibniz Institute for Interactive Materials, Forckenbeckstraße 50, D-52056 Aachen, Germany, Tel.: +49-241-80 233 00, Email: dejeu@dwirwth-aachen.de
- Professor I. M. Ward, FRS, Department of Physics, University of Leeds, Leeds LS2 9JT, UK, Tel: +44(0)1133433809 Fax: +44(0)1133433846, Email: i.m.ward@leeds.ac.uk

## Publications

1. "High Conductivity in Molecularly P-doped Diketopyrrolopyrrole-Based Polymer: the Impact of Record High Dopant Strength and Good Structural Order" Yevhen Karpov, Tim Erdmann, Mahmoud Al-Hussein, Manfred Stamm, Dimiriy Ivanov, Florian Günther, Sibille Gemming, Brigitte Voit, Anton Kiri, **Advanced Materials**, submitted (2016).
2. "Copolymerization of zinc-activated isoindigo- and naphthalene-diimide based monomers: an efficient route to low bandgap  $\pi$ -conjugated random copolymers with tunable properties" Y. Karpov, R. Tkachov, J. Maiti, T. Beryozkina, V. Bakulev, W. Liu, H. Komber, U. Lappan, M. Al-Hussein, M. Stamm, B. Voit, A. Kiri, **Polymer Chemistry**, submitted (2016).
3. "Sulfonated polyimide copolymers based on 4,4'-diaminostilbene-2,2'-disulfonic acid and 3,5,3',5'-tetramethylbenzidine with enhanced solubility" M. H. Kailani, B. A. Sweileh, F. M. Abu-Orabi, M. Y. Mustafa, M. Al-Hussein, **Polym. Bull.**, submitted (2016).

4. "Structural investigation of P(BPMA/CPPHMA) and P(MMA/BPMA/CPPHMA) copolymers" M. Al-Hussein, A. Berndt, D. Jehnichen, L. Häußler, M. Stamm, D. Pospiech, **Polym. Bull.**, submitted (2016).
5. "Comparative study of the nanomorphology of spray and spin coated PTB7 polymer:fullerene films", M. Al-Hussein, E. M. Herzig, M. Schindler, F. Löhner, C. M. Palumbiny, W. Wang, S. V. Roth, P. Müller-Buschbaum, **Polymer Engineering and Science**, submitted (2016).
6. "Test system for through-plane conductivity measurements of hydrogen proton exchange membranes", G. Al-Madani, M. H. Kailani, M. Al-Hussein, **Int. J. Electrochem. Sci.**, 10, 6465 (2015).
7. "Methacrylate copolymers with liquid crystalline side chains for organic gate dielectric applications" A. Berndt, D. Pospiech, H. Komber, D. Jehnichen, L. Häußler, B. Voit, M. Al-Hussein, M. Plötner, A. Kumar, W.-J. Fischer, **ACS Applied Materials & Interfaces**, 7, 12339 (2015).
8. "Influence of semiconductor thickness and molecular weight on the charge transport of a naphthalenediimide-based copolymer in thin-film transistors", Y. Karpov, W. Zhao, I. Raguzin, T. Beryozkina, V. Bakulev, M. Al-Hussein, L. Häußler, M. Stamm, B. Voit, A. Facchetti, R. Tkachov, A. Kiriy, **ACS Applied Materials & Interfaces**, 7,12478 (2015).
9. "Dielectric function of a poly(benzimidazobenzophenanthroline) ladder polymer", S. Kraner, C. Koerner, K. Leo, E. Bittrich, K.-J. Eichhorn, Y. Karpov, A. Kiriy, M. Stamm, K. Hinrichs, M. Al-Hussein, **Phys. Rev. B**, 91, 195202 (2015).
10. "Reversible thermosensitive biodegradable polymeric actuators based on confined crystallization", V. Stroganov, M. Al-Hussein, J.-U. Sommer, A. Janke, S. Zakharchenko, L. Ionov, **Nano Letters**, 15, 1786 (2015).
11. "The distribution of immobilized platinum and palladium nanoparticles within poly(2-vinylpyridine) brushes", M. Al-Hussein, M. Koenig, M. Stamm, P. Uhlmann, **Macromolecular Chemistry and Physics**, 215, 1679 (2014).
12. "In-situ X-ray study of the structural evolution of gold nano domains by spray deposition on thin conductive P3HT films", M. Al-Hussein, M. Schindler, M. A. Ruderer, J. Perlich, M. Schwartzkopf, G. Herzog, B. Heidmann, A. Buffet, S. V. Roth, P. Müller-Buschbaum, **Langmuir**, 29, 2490 (2013).
13. "Structural properties of the active layer of discotic hexabenzocoronene/perylene diimide hulk-hetero junction photovoltaic devices: The role of alkyl side chain length", M. Al-Hussein, H. C. Hesse, J. Weickert, L. Doessel, X. Feng, K. Muellen, L. Schmidt-Mende, **Thin Solid Films**, 520, 307 (2011).
14. "Determination of the local gold contact morphology on a photoactive polymer film using nanobeam GISAXS", M. Ruderer, V. Körstgens, E. Metwalli, M. Al-Hussein, U. Vainio, S. V. Roth, R. Döhrmann, R. Gehrke, R. Gebhardt, M. Burghammer, P. Müller-Buschbaum, **Nucl. Instrum. Methods Phys. Res. B**, 268, 403 (2010).
15. "Discotic materials for organic solar cells: Effects of chemical structure on assembly and performance", H. C. Hesse, J. Weickert, M. Al-Hussein, L. Dössel,

- X. Feng, K. Müllen, L. Schmidt-Mende, **Sol. Energy Mat. Sol. Cells**, 94, 560 (2010).
16. “Determination of the ordered structure in conjugated-coil diblock copolymers films from a thickness gradient prepared by spin-coated drop technique”, M. Al-Hussein, M. Ruderer, E. Metwalli, V. Körstgens, U. Vainio, S. V. Roth, R. Döhrmann, R. Gehrke, R. Gebhardt, M. Burghammer, P. Müller-Buschbaum, **Macromolecules**, 42, 4230 (2009).
  17. “Crystallization induced order in polystyrene-poly(ethylene oxide) metallo-supramolecular diblock copolymer”, M. Al-Hussein, W. H. de Jeu, **Polymer**, 50, 2149 (2009).
  18. “Investigating nanoscopic patterned surfaces of a semifluorinated liquid crystalline diblock copolymer using X-ray scattering techniques”, M. Al-Hussein Conference: **Materials Research Society Symposium Proceedings**; 123-129 Grazing-incidence small-angle X-ray scattering Symposium, Boston, Massachusetts, USA, Volume: 1147 (2008).
  19. “Self-assembly of poly(ferrocenyldimethylsilane-*b*-methyl methacrylate) block copolymers in a selective solvent”, I. Korczagin, M. A. Hempenius, R. G. Fokkink, M. A. Cohen Stuart, M. Al-Hussein, P. H. H. Bomans, P. M. Frederik, G. J. Vancso, **Macromolecules**, 39, 2306 (2006).
  20. “Liquid crystallinity in block copolymers films for polymeric nanopatterns”, W. H. de Jeu, Y. Serero, and M. Al-Hussein, **Adv. Polym. Sci.**, 71, 200 (2006).
  21. “Self-assembly of PFS-*b*-PMMA block copolymers in a selective solvent”, M. A. Hempenius, I. Korczagin, R. G. Fokkink, M. A. Cohen Stuart, M. Al-Hussein, P. H. H. Bomans, P. M. Frederik, G. J. Vancso, **Polymer Preprints**, 47(1), 437 (2006).
  22. “Nano-ordering of fluorinated side-Chain liquid crystalline diblock copolymers”, M. Al-Hussein, Y. Serero, O. Konovalov, A. Mourran, M. Möller, W. H. de Jeu, **Macromolecules**, 38, 9610 (2005).
  23. “Phase behavior of the melt of polystyrene-poly(ethyleneoxide) metallo-supramolecular diblock copolymer with bulky counterions”, M. Al-Hussein, B. G. G. Lohmeijer, U. S. Schubert, and W. H. de Jeu, **Macromolecules**, 38, 2832 (2005).
  24. “Bulk and thin film ordering in side-chain liquid crystalline diblock copolymers: the role of chain length”, M. Al-Hussein, W.H. de Jeu, L. Vranichar, S. Pispas, N. Hadjichristidis, T. Itoh, and J. Watanabe, **Macromolecules**, 37, 6401 (2004).
  25. “Interplay between smectic ordering and microphase separation in a series of side-group liquid-crystal block copolymers”, I. W. Hamley, V. Castelletto, Z. B. Lu, C. T. Imrie, T. Itoh, and M. Al-Hussein, **Macromolecules**, 37, 4798 (2004).
  26. “Hydrophilic elastomers for microcontact printing of polar inks”, D. C. Trimbach, M. Al-Hussein, W. H. de Jeu, M. Decre, D. J. Broer, and C. W. Bastiaansen, **Langmuir**, 20, 4738 (2004).

27. "The stress relaxation behaviour of isotactic poly(1-butene) and its ethylene copolymers", M. Al-Hussein and G. Strobl, **J. Polym. Sci. B: Polym. Phys.**, 42, 2074 (2004).
28. "Bulk morphology of a metallo-supramolecular block copolymer", B.G.G. Lohmeijer, M. Al-Hussein, W. H. de Jeu, J.M.W. Gohy, U.S. Schubert, American Chemical Society. Division of Polymer Chemistry 45(1):464 (2004).
29. "Strain-controlled tensile deformation behavior and relaxation properties of isotactic poly(1-butene) and its ethylene copolymers", M. Al-Hussein and G. Strobl, **Macromolecular Symposia**, 214, 231 (2004).
30. "Melt morphology of polystyrene-poly(ethylene oxide) metallo-supramolecular diblock copolymer", M. Al-Hussein, B. G. G. Lohmeijer, U. S. Schubert, and W. H. de Jeu, **Macromolecules**, 36, 9281 (2003).
31. "On the mechanisms of recrystallization after melting in semicrystalline polymers: The effect of the initial melt state", M. Al-Hussein and G. Strobl, **J. Macromol. Sci. Phys.**, 42, 677 (2003).
32. "A comparative study of the mechanisms of initial crystallization and recrystallization after melting in syndiotactic polypropylene and isotactic polystyrene", M. Al-Hussein and G. Strobl, in: *Polymer Crystallization: Observations, Concepts and Interpretations* / edited by G. Reiter and J.-U. Sommer, Berlin: Springer, p 46-63, (2003).
33. "Strain-controlled tensile deformation behaviour of isotactic poly(1-butene) and its ethylene copolymers", M. Al-Hussein and G. Strobl, **Macromolecules**, 35, 8515 (2002).
34. "Morphological changes during heating semicrystalline polymers to the melt as revealed by SAXS measurements", M. Al-Hussein and G. Strobl, **e-polymers**, no. 038, (2002).
35. "The melting line, the crystallization line and the equilibrium melting temperature of isotactic polystyrene", M. Al-Hussein and G. Strobl, **Macromolecules**, 35, 1672 (2002).
36. "The mechanisms of recrystallization after melting in syndiotactic polypropene and isotactic polystyrene", M. Al-Hussein and G. Strobl, **Eur. Phys. J. E**, 6, 305 (2001).
37. "Preparation of ultra-high modulus materials from metallocene based linear polyethylenes", M. Al-Hussein, G. R. Davies and I. M. Ward, **Polymer**, 42 3679 (2001).
38. "Mechanical properties of oriented low-density polyethylene with an oriented lamellar-stack morphology", M. Al-Hussein, G. R. Davies and I. M. Ward, **J. Polym. Sci. B: Polym. Phys.**, 38, 755 (2000).
39. "On the influence of initial morphology on the internal structure of highly drawn polyethylene" T. Amornsakchai, R. H. Olley, D. C. Bassett, M. Al-Hussein, A. P. Unwin and I.M. Ward, **Polymer**, 41 8291 (2000).