

VITA & PUBLICATIONS

RASHEED M. A. AZZAM

Background

Education:

Ph.D., Electrical Engineering (Electro-Optics), University of Nebraska, Lincoln, 1971.

B.Sc. (Honors), Electrical Engineering (Electronics and Communications), Cairo University, Egypt, 1967.

Experience:

Distinguished Professor of Electrical Engineering and Full Member of the Graduate Faculty, University of New Orleans, August 1982-present.

Professor of Physics, The American University in Cairo, September 1997 – August 1999 (on leave from UNO).

Acting Chairman, Department of Electrical Engineering, University of New Orleans, August 1988 - July 1989 and August 1992 - July, 1993.

Fulbright Senior Research Scholar and Visiting Professor, Département de Physique du Solide, Université de Provence, Marseille, France, September 1985 - July 1986.

Professor of Electrical Engineering and Full Member of the Graduate Faculty, University of New Orleans, August 1981 - July 1982.

Associate Professor of Electrical Engineering and Associate Member of the Graduate Faculty, University of New Orleans, August 1979 - July 1981.

Associate Professor of Research in Engineering, Research Associate Professor of Internal Medicine, and Graduate Faculty Fellow, University of Nebraska - Lincoln, and University of Nebraska Medical Center, Omaha, September 1974 - August 1979.

Postdoctoral Research Fellow, Department of Electrical Engineering, University of Nebraska, Lincoln, January 1972 - September 1974.

Graduate Research Assistant and Lab Instructor, Department of Electrical Engineering, University of Nebraska, Lincoln, September 1969 - December 1971.

Teaching Assistant, Department of Electrical Engineering, Cairo University, September 1967 - August 1969.

Scholarly and Creative Productivity

1. *Publications*

A. Books

a. Scholarly books

i. Refereed

Selected Papers on Ellipsometry, SPIE Milestone Series (SPIE-The International Society for Optical Engineering, Bellingham, Washington, 1991), R. M. A. Azzam, Editor.

Thin Film Optical Devices for Polarized Light, Feature Issue, Vol. 5, No. 9, Journal of the Optical Society of America A (OSA, Washington, D.C., 1988), R. M. A. Azzam and W. H. Southwell, Editors.

Optical Polarimetry, Special Issue, Vol. 20, Nol 1, Optical Engineering (SPIE - The International Society for Optical Engineering, Bellingham, Washington, 1981), R.M.A. Azzam and D. L. Coffeen, Guest Editors.

Proceedings of the Fourth International Conference on Ellipsometry, Vol. 96 of Surface Science (North-Holland, Amsterdam, 1980), R. H. Muller, R.M.A. Azzam, and D. E. Aspnes, Editors.

Ellipsometry and Polarized Light (North-Holland, Amsterdam, 1977), R.M.A. Azzam and N.M. Bashara, Authors. Translated into Russian and published by the Soviet Publishing House Mir, Moscow, 1981. Translated into Chinese and published by Beijing Science Press, 1996. Paperback edition, 1987, 4th printing, 2003.

Optical Polarimetry: Instrumentation and Applications, Vol. 112 of SPIE Proceedings (SPIE-The International Society for Optical Engineering, Bellingham, Washington, 1977), R.M.A. Azzam and D. L. Coffeen, Editors.

Proceedings of the Third International Conference on Ellipsometry, Vol. 56 of Surface Science (North-Holland, Amsterdam, 1976), N.M. Bashara and R.M.A. Azzam, Editors.

Polarized Light: Instruments, Devices, Applications, Vol. 88 of SPIE Proceedings (SPIE-The International Society for Optical Engineering, Bellingham, Washington, 1976), W.L. Hyde and R.M.A. Azzam, Editors.

ii. Non-refereed

None.

B. Refereed/Invited Publications

a. Book Chapters:

R. M. A. Azzam, "Ellipsometry," chapter 27, vol. II, *Handbook of Optics*, 2nd edition, M. Bass, Editor-in-Chief, sponsored by the Optical Society of America (McGraw-Hill, New York, 1995), 27 pages, *Invited*. Updated and revised version will be published in the 3rd edition of the Handbook, 2010.

b. Journal articles

1. Khanfar, H. K. and Azzam, R. M. A., "Broadband IR Polarizing Beam Splitters Using a Subwavelength-Structured One-Dimensional Photonic-Crystal Layer Embedded in a High-Index Prism, *Appl. Opt.* **48**, 5121-5126 (2009).
2. Azzam, R. M. A., "Tilted Parallel Dielectric Slab as a Multilevel Attenuator for Incident *p*- or *s*- Polarized Light," *Appl. Opt.* **48**, 425-428 (2009).
3. Azzam, R. M. A., "Total Internal Reflection without Change of Polarization Using a Right-Angle Prism with Half-Wavelength-Thick Optical Coating," *Opt. Lett.* **34**, 371-373 (2009).

4. Azzam, R. M. A, and Alsamman, A., "Plurality of Principal Angles for a Given Pseudo-Brewster Angle when Polarized Light is Reflected at a Dielectric-Conductor Interface," *J. Opt. Soc. Am. A* **25**, 2858-2864 (2008).
5. Azzam, R. M. A., and Khanfar, "In-Line Broadband 270° ($3\pi/4$) Chevron Four-Reflection Wave Retarders," *Appl. Opt.* **47**, 4878-4883 (2008).
6. Azzam, R. M. A., "Polarization Optics of Interfaces and Thin Films," *Phys. Stat. Sol. (a)* **205**, 709-714 (2008).
7. Azzam, R. M. A, and Alsamman, A., "Quasi Index Matching for Minimum Reflectance at a Dielectric-Conductor Interface for Obliquely Incident p - and s -Polarized Light," *Appl. Opt.* **47**, 3211-3215 (2008).
8. Azzam, R. M. A, and Alsamman, A., "Efficiency of Linear-to-Circular Polarization Conversion for Light Reflection at a Dielectric-Conductor Interface," *J. Opt. Soc. Am. A* **25**, 834-837 (2008).
9. Azzam, R. M. A. and Sudradjat, F. F., "Reflection Coefficients of p - and s -Polarized Light by a Quarter-Wave Layer: Explicit Expressions and Application to Beam Splitters," *Appl. Opt.* **47**, 1103-1108 (2008).
10. Azzam, R. M. A., and Khanfar, "Polarization Properties of Retroreflecting Right-Angle Prisms," *Appl. Opt.* **47**, 359-364 (2008).
11. Perla, S. and Azzam, R. M. A., "Embedded Centro-Symmetric Multilayer Stacks as Complete-Transmission Quarter-Wave and Half-Wave Retarders under Conditions of Frustrated Total Internal Reflection," *J. Opt. Soc. Am. A* **24**, 3255-3260 (2007).
12. Perla, S. and Azzam, R. M. A., "Wide-Angle, High-Extinction-Ratio, Infrared Polarizing Beam Splitters using Frustrated Total Internal Reflection by an Embedded Centro-Symmetric Multilayer," *Appl. Opt.* **46**, 4604-4612 (2007).
13. Azzam, R. M. A., "Parallel-Slab Polarizing Beam Splitter and Photopolarimeter," *Appl. Opt.* **46**, 292-294 (2007).
14. Azzam, R. M. A., "Dividing a Light Beam into Two Beams of Orthogonal Polarizations by Reflection and Refraction at a Dielectric Surface," *Opt. Lett.* **31**, 1525-1527 (2006).
15. Azzam, R. M. A., "Infrared Broadband 50 % - 50 % Beam Splitters for s -Polarized Light," *Appl. Opt.* **45**, 4572-4575 (2006).
16. Azzam, R. M. A, and Sudradjat, F. F., "Quarter-Wave Layers with 50% Reflectance for Incident Unpolarized Light," *J. Opt. Soc. Am. A* **24**, 850-855 (2007).
17. Azzam, R. M. A., and Perla, S. R., "Polarizing Properties of Embedded Symmetric Trilayer Stacks under Conditions of Frustrated Total Internal Reflection," *Appl. Opt.* **45**, 1650-1656 (2006); Erratum, *Appl. Opt.* **46**, 431-433 (2007).
18. Azzam, R. M. A., "Phase Shifts Associated with Frustrated Total Internal Reflection and Optical Tunneling by an Embedded Low-Index Film," *J. Opt. Soc. Am. A* **23**, 960-965 (2006).

19. Azzam, R. M. A., and Spinu, C. L., "Linear-to-Circular Polarization Transformation upon Optical Tunneling Through an Embedded Low-Index Film," *Opt. Lett.* **30**, 3183-3185 (2005).
20. Azzam, R. M. A., De, A., and Sudradjat, F. F., "Bilayer Pellicle and Bilayer-Coated Beam Splitters for the Division-of-Amplitude Photopolarimeter," *Opt. Eng.* **44**, 073802- 073811 (2005).
21. Azzam, R. M. A. and Sudradjat, F. F., "Single-Layer-Coated Beam Splitters for the Division-of-Amplitude Photopolarimeter," *Appl. Opt.* **44**, 190-196 (2005).
22. Azzam, R. M. A., and Spinu, C. L., "Achromatic Angle-Insensitive Quarter-Wave Retarder Based on Total Internal Reflection at the Si-SiO₂ Interface," *J. Opt. Soc. Am. A* **21**, 2019-2022 (2004).
23. Azzam, R. M. A. , "Phase Shifts that Accompany Total Internal Reflection at a Dielectric-Dielectric Interface," *J. Opt. Soc. Am. A* **21**, 1559-1563 (2004).
24. Azzam, R. M. A., Sudradjat, F. F., and Nazim Uddin, M., "Prism Spectroscopic Ellipsometer," *Thin Solid Films* **455-456**, 54-60 (2004).
25. Krishnan, S., Hampton, S, and Azzam, R. M. A., "Spectroscopic Ellipsometry using the Grating Division-of-Amplitude Photopolarimeter (G-DOAP)," *Thin Solid Films* **455-456**, 24-32 (2004).
26. El-Saba, A. M., and Azzam, R. M. A., "Power, Efficiency, and Polarization Analysis of a Beam Splitter for the Equipartition of Infrared Input Power in the Presence of Angular, Film-Thickness, and Spectral Deviations," *Opt. Eng.* **42**, 3487-3490 (2003).
27. Azzam, R. M. A., and De, A., "Optimal Beam Splitters for the Division-of-Amplitude Photopolarimeter," *J. Opt. Soc. Am. A* **20**, 955-958 (2003).
28. Krishnan, S, Hampton, S., Rix, J., Taylor, B., and Azzam, R. M. A., "Spectral Polarization Measurement by use of the Grating Division-of-Amplitude Photopolarimeter," *Appl. Opt.* **42**, 1216-1227 (2003).
29. Azzam, R. M. A., and De, A., "Circular Polarization Beam Splitter that Uses Frustrated Total Internal Reflection by an Embedded Symmetric Achiral Multilayer Coating," *Opt. Lett.* **28**, 355-357 (2003).
30. El-Saba, A. M. and Azzam, R. M. A., "Design and Analysis of Strip-Coated Parallel-Slab Beam Splitter for the Equipartition of Infrared Input Power," *Opt. Eng.* **41**, 200-204 (2002).
31. Azzam, R. M. A., and Mahmoud, F. A., "Symmetrically Coated Pellicle Beam Splitters for Dual Quarter-Wave Retardation in Reflection and Transmission," *Appl. Opt.* **41**, 235-238 (2002).
32. Azzam, R. M. A., and Ugbo, E. E., "Angular Range for Reflection of p-Polarized Light at the Surface of an Absorbing Medium with Reflectance Below That at Normal Incidence," *J. Opt. Soc. Am. A* **19**, 112-115 (2002).
33. Azzam, R. M. A. and Howlader, M. M. K., "Fourth- and Sixth-Order Polarization Aberrations of Antireflection-Coated Optical Surfaces," *Opt. Lett.* **26**, 1607-1608 (2001).
34. Azzam, R. M. A., and Mahmoud, F. A., "Tilted Bilayer Membranes as Simple Transmission Quarter-Wave Retardation Plates," *J. Opt. Soc. Am. A* **18**, 421-425 (2001).

35. Azzam, R. M. A., "Poincaré Sphere Representation of the Fixed-Polarizer Rotating-Retarder Optical System," *J. Opt. Soc. Am. A* **17**, 2105-2107 (2000).
36. El-Saba, A. M., Azzam, R. M. A, and Abushagur, M. A. G., "Performance Optimization and Light-Beam-Deviation Analysis of the Parallel-Slab Division-of-Amplitude Photopolarimeter, " *Appl. Opt.* **38**, 2829-2836 (1999).
37. Azzam, R. M. A., "Differential Reflection Phase Shift Under Conditions of Attenuated Internal Reflection, " *J. Opt. Soc. Am. A* **16**, 1700-1702 (1999).
38. Azzam, R. M. A., El-Saba, A. M., and Abushagur, M. A. G., "Spectrophotopolarimeter Based on Multiple Reflections in a Coated Dielectric Slab, " *Thin Solid Films* **313/314**, 53-57 (1998).
39. Liu, J. and Azzam, R. M. A., "Effect of Light-Beam Deviation on the Instrument Matrix of the Four-Detector Photopolarimeter, " *Opt. Eng.* **36**, 943-951 (1997).
40. Liu, J. and Azzam, R. M. A., "Corner-Cube Four-Detector Photopolarimeter," *Opt. Laser Technol.* **29**, 233-238 (1997).
41. Mahmoud, F., and Azzam, R. M. A., "Optical Monitoring of Contamination on High-Voltage Insulator Surfaces," *IEEE Trans. Dielectrics & Elect.* **4**, 33-38 (1997).
42. Azzam, R. M. A., and Howlader, M. M. K., "Infrared Reflection Polarizers Using Uniform and Gaussian Low-Index Layers Buried in High-Index Substrates," *Opt. Eng.* **36**, 217-221 (1997).
43. Liu, J. and Azzam, R. M. A., "Polarization Properties of Corner Cube Retroreflectors: Theory and Experiment," *Appl. Opt.* **36**, 1553-1559 (1997).
44. El-Saba, A. M., Azzam, R. M. A., and Abushagur, M. A. G., "Parallel-Slab Division-of-Amplitude Photopolarimeter," *Opt. Lett.* **21**, 1709-1711 (1996).
45. Liu, J., and Azzam, R. M. A., "Infrared Quarter-Wave Reflection Retarders Based on High-Spatial-Frequency Dielectric Surface-Relief Gratings on Gold Substrates at Oblique Incidence," *Appl. Opt.* **35**, 5557-5562 (1996).
46. Cui, Y., and Azzam, R. M. A., "Determination of Refractive Index and Thickness of Transparent Pellicles Using Polarization-Independent Absentee-Layer Condition," *Appl. Opt.* **35**, 5040-5043 (1996).
47. Azzam, R. M. A., and Howlader, M. M. K., "Silicon-Based Polarization Optics for the 1.30 and 1.55 μm Communication Wavelengths," *J. Lightwave Technol.* **14**, 873-878 (1996).
48. Cui, Y. and Azzam, R. M. A. "Applications of the Normal-Incidence Rotating-Sample Ellipsometer to High- and Low-Spatial-Frequency Gratings," *Appl. Opt.* **35**, 2235-2238 (1996).
49. Cui, Y. and Azzam, R. M. A., "Sixteen-Beam Grating-Based Division-of-Amplitude Photopolarimeter," *Opt. Lett.* **21**, 89-91 (1996).
50. Azzam, R. M. A., "Ellipsometry for the Characterization of Optical Coatings," *Rev. Laser Eng. (Japan)* **24**, 209-219 (1996).

51. Azzam, R. M. A., and Howlader, M. M. K. "Bilayer Coatings that Produce 90° Differential Reflection Phase Shift at Oblique Incidence," *Thin Solid Films* **272**, 143-147 (1996).
52. Cui, Y. and Azzam, R. M. A., "Calibration and Testing of a Sixteen-Beam Grating-Based Division-of-Amplitude Photopolarimeter," *Rev. Sci. Instrum.* **66**, 5552-5558 (1995).
53. Azzam, R. M. A., "Characterization of Native and Adsorbed Thin Films on Silicon Detector Surfaces: Static and Kinetic Applications," *Thin Solid Films* **270**, 289-294 (1995).
54. Bouzid, A., Abushagur, A. G., El-Sabae, A., and Azzam, R. M. A., "Fiber-Optic Four-Detector Polarimeter," *Opt. Commun.* **118**,329-334 (1995).
55. Azzam, R. M. A., and Kan'an, A. M., "Extreme Ultraviolet Polarizing Optics Using Bare and Aluminum-Coated Silicon Carbide," *Appl. Opt.* **34**, 6438-6442 (1995).
56. Azzam, R. M. A., Howlader, M. M. K., and Georgiou, T. Y., "Single-Layer-Coated Surfaces with Linearized Reflectance Versus Angle of Incidence: Application to Passive and Active Silicon Rotation Sensors," *J. Opt. Soc. Am. A* **12**, 1790-1796 (1995).
57. Azzam, R. M. A., and Howlader, M. M. K., "Real-Time Adsorption/Desorption Thin-Film Optical Monitor Using a Windowless Reflective Silicon Detector," *Rev. Sci. Instrum.* **66**, 4362-4366 (1995).
58. Kan'an, A. M., and Azzam, R. M. A., "Principal Angles and Principal Azimuths of In-Line Symmetric Three-Reflection Mirror System: Application to Circular Polarization of Vacuum Ultraviolet Radiation," *Opt. Eng.* **34**, 1551-1557 (1995).
59. Howlader, M. M. K., and Azzam, R. M. A., "Periodic and Quasiperiodic Nonquarterwave Multilayer Coatings for 90-deg Reflection Phase Retardance at 45-deg Angle of Incidence," *Opt. Eng.* **34**, 869-875 (1995).
60. Azzam, R. M. A., "Simple General Analysis of the Polarization-Dependent Insertion Loss of a Linear Optical System," *Pure Appl. Opt. (J. Europ. Opt. Soc. Part A)* **3**, 731-736 (1994).
61. Azzam, R. M. A., and Howlader, M. M. K., "Measurement of the Thickness of Dielectric Thin Films on Silicon Photodetectors Using the Angular Response to Incident Linearly Polarized Light," *IEEE Trans. Instrum. Measur.* **43**, 799-802 (1994).
62. Azzam, R. M. A., "Polarized Light Reflectometer," *Appl. Opt.* **33**, 6009-6011 (1994).
63. Kan'an, A. M., and Azzam, R. M. A., "In-Line Quarter-Wave Retarders for the IR Using Total Refraction and Total Reflection in a Prism," *Opt. Eng.* **33**, 2029-2033 (1994).
64. Azzam, R. M. A., and Kan'an A. M. "In-Line Variable-Phase Reflection Retarder Using a Coated Deformable Three-Mirror System," *Pure Appl. Opt. (J. Europ. Opt. Soc. Part A)* **3**, 1-5 (1994).
65. Azzam, R. M. A., and Forgala, G. W., "Creation of an Optical XYZ Coordinate System Using Bidirectional Blazing from a Symmetric Triangular-Groove Grating in a Conical Diffraction Mount," *Opt. Lett.* **18**, 2162-2164 (1993).
66. Azzam, R. M. A., "Polarization Michelson Interferometer (POLMINT) as a Global Polarization State Generator and for Measurement of the Coherence and Spectral Properties of Quasi- Monochromatic Light," *Rev. Sci. Instrum.* **64**, 2834-2838 (1993).

67. Azzam, R. M. A., "Multichannel Polarization State Detectors for Time-Resolved Ellipsometry," *Thin Solid Films* **234**, 371-374 (1993).
68. Azzam, R. M. A., "Polarization Michelson Interferometer (POLMINT): Its Use for Polarization Modulation and Temporal Pulse Shearing," *Opt. Commun.* **98**, 19-23 (1993).
69. Azzam, R. M. A. and Giardina, K. A., "Photopolarimeter Based on Planar Grating Diffraction," *J. Opt. Soc. Am. A* **10**, 1190-1196 (1993).
70. Azzam, R. M. A., "Chiral Thin Solid Films: Method of Deposition and Applications," *Appl. Phys. Lett.* **61**, 3118-3120 (1992).
71. Azzam, R. M. A., and Giardina, K. A., "Polarization Analysis Based on Grating Conical Diffraction," *SPIE Proc.* **1746**, 2-13 (1992).
72. Azzam, R. M. A., and Habli, M. A., "Bilayer Coatings for Light Refraction without Change of Polarization," *J. Mod. Opt.* **39**, 2255-2263 (1992).
73. Azzam, R. M. A., "Division-of-Amplitude Photopolarimeter Based on Conical Diffraction from a Metallic Grating," *Appl. Opt.* **31**, 3574-3576 (1992).
74. Azzam, R. M. A., "Limaçon of Pascal Locus of the Complex Refractive Indices of Interfaces with Maximally Flat Reflectance-versus-Angle Curves for Incident Unpolarized Light," *J. Opt. Soc. Am. A* **9**, 957-963 (1992).
75. Azzam, R. M. A., and Giardina, K. A., "Achieving a Given Reflectance for Unpolarized Light by Controlling the Incidence Angle and the Thickness of a Transparent Film on an Absorbing Substrate: Application to Energy Equipartition in the Four-Detector Photopolarimeter," *Appl. Opt.* **31**, 935-942 (1992).
76. Azzam, R. M. A., "Principal Linear Polarization States of an Optical System," *J. Opt. Soc. Am. A* **9**, 147-150 (1992).
77. Azzam, R. M. A., Giardina, K. A., and Lopez, A. G., "Conventional and Generalized Mueller-Matrix Ellipsometry Using the Four-Detector Photopolarimeter," *Opt. Eng.* **30**, 1583-1589 (1991).
78. Azzam, R. M. A., "Arrangement of Two Reflective Photodetectors for Measuring All Four Stokes Parameters of Light," *Rev. Sci. Instrum.* **62**, 2080-2082 (1991).
79. Azzam, R. M. A., "Transmission Ellipsometry on Transparent Unbacked or Embedded Thin Films with Application to Soap Films in Air," *Appl. Opt.* **30**, 2801-2806 (1991).
80. Azzam, R. M. A., "Longitudinal Polarization-Dependent Coupling of Light from an Optical Fiber to a Side-Bonded Planar Proximity Detector: Application to Integrated Azimuthally Distributed Multi-Detector Photopolarimeters," *IEEE Photon. Tech. Lett.* **2**, 893-895 (1990).
81. Azzam, R. M. A., "Determination of the Complex Dielectric Function of an Unbacked or Embedded Thin Film by Grazing-Incidence Reflection or Transmission Ellipsometry," *Opt. Commun.* **80**, 103-106 (1990).

82. Azzam, R. M. A., and Habli, M. A., "Coating a Transparent Substrate by a Transparent Thin Film to Produce a Given Transmission Differential Phase Retardance without Diattenuation for Obliquely Incident Monochromatic Light," *Opt. Commun.* **78**, 315-321 (1990).
83. Azzam, R. M. A. and D. C. Nick, "Stokes-Parameter Photopolarimeter Using an Optically or Mechanically Rotatable Two-Detector Assembly," *IEEE Trans. Instrum. Measur.* **39**, 722-725 (1990).
84. Azzam, R. M. A. and Lopez, A. G., "Precision Analysis and Low-Light-Level Measurements Using a Prototype Four-Detector Photopolarimeter," *Rev. Sci. Instrum.* **61**, 2063-2068 (1990).
85. Azzam, R. M. A., "Instrument Matrix of the Four-Detector Photopolarimeter: Physical Meaning of its Rows and Columns and Constraints on its Elements," *J. Opt. Soc. Am. A* **7**, 87-91 (1990).
86. Nick, D. C., and Azzam, R. M. A., "Performance of an Automated Rotating-Detector Ellipsometer," *Rev. Sci. Instrum.* **60**, 3625-3632 (1989).
87. Azzam, R. M. A. and Ugbo, E. E., "Contours of Constant Pseudo-Brewster Angle in the Complex ϵ Plane and an Analytical Method for the Determination of Optical Constants," *Appl. Opt.* **28**, 5222- 5228 (1989).
88. Azzam, R. M. A. and Lopez, A. G., "Accurate Calibration of the Four-Detector Photopolarimeter with Imperfect Polarizing Optical Elements," *J. Opt. Soc. Am. A* **6**, 1513-1521 (1989).
89. Azzam, R. M. A., "Analytical Determination of the Complex Dielectric Function of an Absorbing Medium from Two Angles of Incidence of Minimum Parallel Reflectance," *J. Opt. Soc. Am. A* **6**, 1213-1216 (1989).
90. Azzam, R. M. A. and El-Saba, A. M., "Maximum Rate of Change of the Differential Reflection Phase Shift with Respect to Angle of Incidence for Light Reflection at the Surface of an Absorbing Medium," *Appl. Opt.* **28**, 1365-1368 (1989).
91. Habli, M. A., Azzam, R. M. A., and El-Saba, A. M., "Single-Layer Coating of One Mirror of a 90°-Rooftop Reflector for Equal p and s Net Complex Reflection Coefficients," *Opt. Commun.* **69**, 181-184 (1989).
92. Azzam, R. M. A., "Polarization-Based Technique for Separating Copropagating Waves of Different Wavelengths," *Opt. Commun.* **68**, 396-398 (1988).
93. Azzam, R. M. A., "Binary Polarization Modulator: A Simple Device for Switching Light Polarization between Orthogonal States," *Opt. Lett.* **13**, 701-703 (1988).
94. Azzam, R. M. A., and El-Saba, A. M., "Reflectance of an Absorbing Substrate for Incident Light of Arbitrary Polarization: Appearance of a Secondary Maximum at Oblique Incidence," *Appl. Opt.* **27**, 4034-4037 (1988).
95. Azzam, R. M. A., "Division-of-Wavefront Thin-Film Beam Splitter for Generating Binary Patterns of Orthogonal Elliptical Polarization States," *J. Opt. Soc. Am. A* **5**, 1576-1580 (1988).
96. Azzam, R. M. A., "Extrema of the Magnitude and Phase of a Complex Function of a Real Variable: Application to Attenuated Internal Reflection," *J. Opt. Soc. Am. A* **5**, 1187-1192 (1988).
97. Azzam, R. M. A., "Single-Layer-Coated Optical Devices for Polarized Light," *Thin Solid Films* **163**, 33-41 (1988).

98. Azzam, R. M. A., Elminyaw, I.M., and El-Saba, A.M., "General Analysis and Optimization of the Four-Detector Photopolarimeter," *J. Opt. Soc. Am. A* **5**, 681-689 (1988).
99. Azzam, R. M. A., Masetti, E., Elminyaw, I.M., and Grosz, F.B., "Construction, Calibration, and Testing of a Four-Detector Photopolarimeter," *Rev. Sci. Instrum.* **59**, 84-88 (1988).
100. Azzam, R. M. A. and Habli, M.A., "Constraint on the Optical Constants of a Transparent Film on an Absorbing Substrate for Inversion of the Ratio of Complex p and s Reflection Coefficients at a Given Angle of Incidence," *Appl. Opt.* **26**, 4717-4721 (1987).
101. Azzam, R. M. A., "In-Line Light-Saving Photopolarimeter and its Fiber-Optic Analog," *Opt. Lett.* **12**, 558-560 (1987).
102. Azzam, R. M. A., "Integrated Polarimeters Based on Anisotropic Photodetectors," *Opt. Lett.* **12**, 555-557 (1987).
103. Azzam, R. M. A., "Angular Sensitivity of Brewster-Angle Reflection Polarizers: An Analytical Treatment," *Appl. Opt.* **26**, 2847-2850 (1987).
104. Azzam, R. M. A., Bu-Habib, E., Casset, J., Chassaing, G. and Gravier, P., "Antireflection of an Absorbing Substrate by an Absorbing Thin Film," *Appl. Opt.* **26** 719-722 (1987).
105. Azzam, R. M. A., "Coating a Transparent Substrate by a Transparent Thin Film for Equal p and s Reflectances: All Possible Solutions," *Thin Solid Films* **147**, 17-24 (1987).
106. Azzam, R. M. A., "Polarizing Beam Splitters for Infrared and Millimeter Waves Using Single-Layer-Coated Dielectric Slab or Unbacked Films," *Appl. Opt.* **25**, 4225-4227 (1986).
107. Azzam, R. M. A., "Response of the Rotating-Detector Ellipsometer for Incident Partially Polarized Light," *Appl. Opt.* **25**, 4224-4225 (1986).
108. Azzam, R. M. A., "Thin-Film Beam Splitter that Reflects Light as a Half-wave Retarder and Transmits it without Change of Polarization: Application to a Michelson Interferometer," *J. Opt. Soc. Am. A* **3**, 1803-1808 (1986).
109. Azzam, R. M. A., "Relationship between the p and s Fresnel Reflection Coefficients of an Interface Independent of Angle of Incidence," *J. Opt. Soc. Am. A* **3**, 928-929 (1986).
110. Azzam, R. M. A., "Mueller-Matrix Measurement using the Four-Detector Photopolarimeter," *Opt. Lett.* **11**, 270-272 (1986).
111. Javily, K. and Azzam, R. M. A., "Coating a Transparent or Absorbing Substrate by a Transparent Thin Film for Minimum Reflectance of Unpolarized Light at Oblique Incidence," *Optik* **72**, 75-78 (1986).
112. Azzam, R. M. A. and Javily, K., "Total Refraction at Oblique Incidence by a Transparent Bilayer Coating a High-Index Transparent or Absorbing Substrate," *Appl. Opt.* **24** 4454-4459 (1985).
113. Azzam, R. M. A., "Reflective Thin-Film Device for Generating Spatial Binary Patterns of Orthogonal Circular Polarization States," *Opt. Commun.* **55**, 297-299 (1985).
114. Azzam, R. M. A., "Two-Detector Ellipsometer," *Rev. Sci. Instrum.* **56**, 1746-1748 (1985).

115. Azzam, R. M. A., "Rotating-Detector Ellipsometer for Measurement of the State of Polarization of Light," *Opt. Lett.* **10**, 427-429 (1985).
116. Azzam, R. M. A., "Arrangement of Four Photodetectors for Measuring the State of Polarization of Light," *Opt. Lett.* **10**, 309- 311 (1985).
117. Azzam, R. M. A., "Beam Splitters for the Division-of-Amplitude Photopolarimeter (DOAP)," *Optica Acta* **32**, 1407-1412 (1985).
118. Azzam, R. M. A., and Perilloux, B.E., "Equalization of the Complex Reflection Coefficients for the Parallel and Perpendicular Polarizations of an Absorbing Substrate Coated by a Transparent Thin Film," *Optica Acta* **32**, 767-777 (1985).
119. Azzam, R. M. A., and Perilloux, B.E., "Constraint on the Optical Constants of a Film-Substrate System for Operation as an External-Reflection Retarder at a Given Angle of Incidence," *Appl. Opt.* **24**, 1171-1179 (1985).
120. Thonn, T.F. and Azzam, R. M. A., "Determination of the Optical Constants and Thickness Profile of a Tapered Inconel Film by Reflection Ellipsometry," *Thin Solid Films* **127**, 215-222 (1985).
121. Azzam, R. M. A., "Explicit Equations for the Polarizing Angles of a High-Reflectance Substrate Coated by a Transparent Thin Film," *J. Opt. Soc. Am. A* **2**, 480-482 (1985).
122. Azzam, R. M. A., "Variable-Reflectance Thin-Film Polarization- Independent Beam Splitters for 0.6328- and 10.6 μm Laser Light," *Opt. Lett.* **10**, 110-112 (1985).
123. Azzam, R. M. A., "Simultaneous Reflection and Refraction of Light without Change of Polarization by a Single-Layer-Coated Dielectric Surface", *Opt. Lett.* **10**, 107-109 (1985).
124. Azzam, R. M. A. and Javily, K., "Antireflecting and Polarizing Transparent Bilayer Coatings on Absorbing Substrates at Oblique Incidence," *Appl. Opt.* **24**, 519-526 (1985).
125. Azzam, R. M. A., "Single-Layer Antireflection Coatings on Absorbing Substrates for the Parallel and Perpendicular Polarizations at Oblique Incidence," *Appl. Opt.* **24**, 513-518 (1985).
126. Azzam, R. M. A., "Extinction of the p and s Polarizations of a Wave upon Reflection at the Same Angle from a Transparent Film on an Absorbing Substrate: Applications to Parallel-Mirror Crossed Polarizers and a Novel Integrated Polarimeter," *J. Opt. Soc. Am. A* **2**, 189-197 (1985).
127. Thonn, T.F. and Azzam, R. M. A., "Multiple-Reflection Polarizers using Dielectric-Coated Metallic Mirrors," *Opt. Eng.* **24**, 202-206 (1985).
128. Arndt, D.P., Azzam, R. M. A., Bennett, J.M., Borgogno, J.P., Carniglia, C.K., Case, W.E., Dobrowolski, J.A., Gibson, U.J., Hart, T. Tuttle Ho, F.C., Hodgkin, V.A., Klapp, W.P., Macleod, H.A., Pelletier, E. Purvis, M.K., Quinn, D.M., Strome, D.H., Swenson, R., Temple, P.A., and Thonn, T.F., "Multiple Determination of the Optical Constants of Thin Film Coating Materials," *Appl. Opt.* **23**, 3571-3596 (1984).
129. Thonn, T. F. and Azzam, R. M. A., "Three-Reflection Halfwave and Quarterwave Retarders using Dielectric-Coated Metallic Mirrors," *Appl. Opt.* **23**, 2752-2759 (1984).

130. Perilloux, B.E. and Azzam, R. M. A., "Low-Distortion Electro-Optic Intensity-Modulation System with Optical Feedback," *Opt. Commun.* **50**, 303-306 (1984).
131. Azzam, R. M. A., "Division-of-Wavefront Polarizing Beam Splitter and Half-Shade Device using Dielectric Thin Film on Dielectric Substrate," *Appl. Opt.* **23**, 1296-1298 (1984).
132. Azzam, R. M. A., "Inverting the Ratio of the Complex Parallel and Perpendicular Reflection Coefficients of an Absorbing Substrate Using a Transparent Thin-Film Coating," *J. Opt. Soc. Am. A* **1**, 699-702 (1984).
133. Azzam, R. M. A., "Theory, Implementation, and Applications of AIDER," *J. Physique (Paris)* **44**, C10, 71-74 (1983).
134. Azzam, R. M. A., "Ellipsometry of Unsupported and Embedded Thin Films," *J. Physique (Paris)* **44**, C10, 67-70 (1983).
135. Azzam, R. M. A. and Thonn, T. F., "Pseudo-Brewster and Second-Brewster Angles of an Absorbing Substrate Coated by a Transparent Thin Film," *Appl. Opt.* **22**, 4155-4165 (1983).
136. Azzam, R. M. A., "Explicit Equations for the Second Brewster Angle of an Interface between a Transparent and an Absorbing Medium," *J. Opt. Soc. Am.* **73**, 1211-1212 (1983).
137. Azzam, R. M. A. and Kemp, R. H., Jr., "AIDER Functions of Stratified and Inhomogeneous Light-Reflecting Structures," *Surface Sci.* **135**, 261-275 (1983).
138. Azzam, R. M. A., "On the Reflection of Light at 45 Angle of Incidence," *Optica Acta* **26** 113-115, 301 (1979).
139. Azzam, R. M.A., "Simple and Direct Determination of Complex Refractive Index and Thickness of Unsupported or Embedded Thin Films by Combined Reflection and Transmission Ellipsometry at 45 Angle of Incidence," *J. Opt. Soc. Am.* **73**, 1080-1082 (1983).
140. Azzam, R. M. A., "ZnS-Ag Film-Substrate Parallel-Mirror Beam Displacers that Maintain Polarization of 10.6 μm Radiation over a Wide Range of Incidence Angles," *Infrared Physics* **23**, 195- 197 (1983).
141. Azzam, R. M. A., "Maximum Minimum Reflectance of Parallel-Polarized Light at Interfaces between Transparent and Absorbing Media," *J. Opt. Soc. Am.* **73**, 959-962 (1983).
142. Azzam, R. M. A., "Grazing-Incidence Differential Reflectance Method for Explicit Determination of Complex Dielectric Function of an Isotropic Absorbing Medium," *Rev. Sci. Instrum.* **54**, 853-855 (1983).
143. Azzam, R. M. A., "Angle-of-Incidence Derivatives of the Complex Parallel and Perpendicular Reflection Coefficients and their Ratio for a Film-Substrate System," *Optica Acta* **30**, 1113-1124 (1983).
144. Azzam, R. M. A. and Khan, M. E. R., "Complex Reflection Coefficients for the Parallel and Perpendicular Polarizations of a Film-Substrate System," *Appl. Opt.* **22**, 253-264 (1983).
145. Azzam, R. M. A. and Khan, M. E. R., "Single-Reflection Film-Substrate Halfwave Retarders with Nearly Stationary Reflection Properties over a Wide Range of Incidence Angles," *J. Opt. Soc. Am.* **73**, 160-166 (1983).

146. Azzam, R. M. A. and Khan, M. E. R., "Equalization of the TE and TM Complex Eigenvalues of 90°-Roof-Top Reflectors and Waxicons Using Thin-Film Dielectric Coatings," *Opt. Commun.* **44**, 223-228 (1983).
147. Azzam, R. M. A., "The Change of Polarization that Accompanies Normal Incidence Reflection from a Passive Isotropic Surface," *Optik* **63**, 37-41 (1982).
148. Azzam, R. M. A., "Explicit Determination of the Complex Refractive Index of an Absorbing Medium from Reflectance Measurements at and Near Normal Incidence," *J. Opt. Soc. Am.* **72**, 1439-1440 (1982).
149. Azzam, R. M. A. and Khan, M. E. R., "Polarization-Preserving Single-Layer-Coated Beam Displacers and Axicons," *Appl. Opt.* **21**, 3314-3322 (1982).
150. Azzam, R. M. A., "Scheme to Polarization-Correct a Waxicon," *Appl. Opt.* **21**, 3067-3068 (1982).
151. Azzam, R. M. A., "Stationary Property of Normal-Incidence Reflection from Isotropic Surfaces," *J. Opt. Soc. Am.* **72**, 1187- 1189 (1982).
152. Elshazly-Zaghloul, M. and Azzam, R. M. A., "Brewster and Pseudo-Brewster Angles of Uniaxial Crystal Surfaces and their Use for Determination of Optical Properties," *J. Opt. Soc. Am.* **72**, 657-661 (1982); Erratum, *J. Opt. Soc. Am. A* **6**, 607 (1989).
153. Azzam, R. M. A., "Interfaces between Transparent Media that Allow Total Reflection or Total Refraction of Parallel-Polarized Light at the Same Angle of Incidence," *Opt. Commun.* **41**, 223-225 (1982).
154. Azzam, R. M. A., "Displacement of a Monochromatic Light Beam Parallel to itself without Change of Polarization," *Opt. Lett.* **7**, 80-82 (1982).
155. Azzam, R. M. A., "Division-of-Amplitude Photopolarimeter (DOAP) for the Simultaneous Measurement of All Four Stokes Parameters of Light," *Optica Acta* **29**, 685-689 (1982).
156. Zaghloul, A.-R. M. and Azzam, R. M. A., "Constant-Psi Constant-Delta Contour Maps: Applications to Ellipsometry and to Reflection-Type Optical Devices," *Appl. Opt.* **21**, 739-743 (1982).
157. Azzam R. M. A., "Contours of Constant Principal Angle and Constant Principal Azimuth in the Complex Plane," *J. Opt. Soc. Am.* **71**, 1523-1528 (1981).
158. Azzam, R. M. A., "Explicit Determination of Thickness of a Transparent Film on a Transparent Substrate from Angles of Incidence of Equal p and s Reflectivities," *Appl. Opt.* **20**, 3274- 3275 (1981).
159. Azzam, R. M. A., "Backscattering Mueller-Matrix Photopolarimeter with Nonreciprocal Polarizing-Analyzing Optics," *Opt. Lett.* **6**, 417-418 (1981).
160. Azzam, R. M. A., "Perpendicular-Incidence Photometric Ellipsometry (PIPE) of Surfaces with Arbitrary Anisotropy," *J. Opt. (Paris)* **12**, 317-321 (1981).
161. Azzam, R. M. A., "Measurement of the Jones Matrix of an Optical System by Return-Path Null Ellipsometry," *Optica Acta* **28**, 795-800 (1981).

162. Azzam, R. M. A., "Measurement of the Ratio of Complex Principal Reflection coefficients of Optically Isotropic and Anisotropic Surfaces using Birefringence-Modulation Return-Path Ellipsometry," *Optik* **58**, 251-257 (1981).
163. Azzam, R. M. A., "Perpendicular-Incidence Null Ellipsometry of Surfaces with Arbitrary Anisotropy," *Opt. Eng.* **20**, 58-61 (1981).
164. Azzam, R. M. A., "Mapping of Fresnel's Interface Reflection Coefficients between Normal and Oblique Incidence: Results for the Parallel and Perpendicular Polarizations at Several Angles of Incidence," *Appl. Opt.* **19**, 3361-3369 (1980).
165. Azzam, R. M. A., "Determination of the Optic Axis and Optical Properties of Absorbing Uniaxial Crystals by Reflection Perpendicular-Incidence Ellipsometry on Wedge Samples," *Appl. Opt.* **19**, 3092-3095 (1980).
166. Azzam, R. M. A., "Modulated-Mueller-Matrix Photopolarimetry (MMMP): A Technique for the Study of Elastic Light Scattering by Depolarizing Temporally Modulated Media and Surfaces," *Opt. Lett.* **5**, 303-305 (1980).
167. Davis, R. B., Azzam, R. M. A., and Holtz, G., "Ellipsometric Observations of Surface Adsorption and Molecular Interactions of Native and Modified Fibrinogen and Factor VIII," *Surface Sci.* **96**, 539-554 (1980).
168. Zaghoul, A.-R. M., and Azzam, R. M. A., "Single-Element Rotating-Polarizer Ellipsometer: Psi Meter," *Surface Sci.* **96**, 168- 173 (1980).
169. Azzam, R. M. A., "Ellipsometry of Transparent Films on Transparent Substrates," *Surface Sci.* **96**, 67-80 (1980).
170. Elshazly-Zaghoul , M., and Azzam, R. M. A., "Inversion of the Nonlinear Equations of Reflection Ellipsometry for Uniaxial Crystals in Symmetrical Orientations," *J. Opt. Soc. Am.* **70**, 880-883 (1980).
171. Azzam, R. M. A., "Fresnel Coefficients of Light Reflection at Interfaces between Transparent Media: A Complete Picture of their Behavior," *Optik* **56**, 401-412 (1980).
172. Azzam, R. M. A., "Conjugate Interfaces: Interfaces between Transparent Media of the Same Reflection Coefficient for the Parallel Polarization at the Same Angle of Incidence," *Opt. Acta* **27**, 419-428 (1980).
173. Azzam, R. M. A., "Light-Reflection Liquid-Level Sensor," *IEEE Trans. Instr. Measur.* **29**, 113-115 (1980).
174. Azzam, R. M. A., "Equalization of Reflectance of Parallel-Polarized Electromagnetic Plane Waves at Normal and Oblique Incidence of Interfaces between Transparent Media and its Use for Measurement of the Dielectric Constant," *Appl. Phys.* **20**, 193-195 (1979).
175. Azzam, R. M. A., "Direct Relation between Fresnel's Interface Reflection Coefficients for the Parallel and Perpendicular Polarizations," *J. Opt. Soc. Am.* **69**, 1007-1016 (1979).
176. Azzam, R. M. A., "Relations between Amplitude Reflectances and Phase Shifts of the p and s Polarizations when Electromagnetic Radiation Strikes Interfaces between Transparent Media," *Appl. Opt.* **18**, 1884-1886 (1979).

177. Azzam, R. M. A., "Transformation of Fresnel's Interface Reflection and Transmission Coefficients between Normal and Oblique Incidence," *J. Opt. Soc. Am.* **69**, 590-596 (1979).
178. Azzam, R. M. A., "Reflection of an Electromagnetic Plane Wave with 0 or π Phase Shift at the Surface of an Absorbing Medium," *J. Opt. Soc. Am.* **69**, 487-488 (1979).
179. Azzam, R. M. A., "Optical Detection of Cell-Surface Changes Associated with Malignant Transformations in Vitro," *Microscop. Acta* **81**, 313-316 (1979).
180. Azzam, R. M. A., "Photo-Optical Waveform Generation," *Optik* **52**, 87-89 (1978).
181. Azzam, R. M. A., "Measurement of the Stokes Parameters of Light: A Unified Analysis of Fourier Photopolarimetry," *Optik* **52**, 253-256 (1979).
182. Azzam, R. M. A., "Propagation of Partially Polarized Light Through Anisotropic Media with or without Depolarization: A Differential 4x4 Matrix Calculus," *J. Opt. Soc. Am.* **68**, 1756-1767 (1978).
183. Azzam, R. M. A., "Consequences of Light Reflection at the Interface Between Two Transparent Media Such That the Angle of Refraction is 45° ," *J. Opt. Soc. Am.* **68**, 1613-1615 (1978).
184. Azzam, R. M. A., "A Simple Fourier Photopolarimeter with Rotating Polarizer and Analyzer for Measuring Jones and Mueller Matrices," *Opt. Commun.* **25**, 137-140 (1978).
185. Azzam, R. M. A., "Photopolarimetric Measurement of the Mueller Matrix by Fourier Analysis of a Single Detected Signal," *Opt. Lett.* **2**, 148-150 (1978).
186. Azzam, R. M. A., "Photoelectronic Phase and Frequency Modulation," *Proc. IEEE* **66**, 606-607 (1978).
187. Azzam, R. M. A., "Simulation of Mechanical Rotation by Optical Rotation: Application to the Design of a New Fourier Photopolarimeter," *J. Opt. Soc. Am.* **68**, 518-521 (1978).
188. Azzam, R. M. A., "Generalized Ellipsometry Based on Azimuth Measurements Alone," *J. Opt. Soc. Am.* **68**, 514-518 (1978).
189. Azzam, R. M. A., Rigby, P. G., and Krueger, J. A., "On the Estimation and Interpretation of Film Thickness in an Ellipsometric Protein-Adsorption Experiment," *Optik* **50**, 249-250 (1978).
190. Zaghoul, A.-R. M., Azzam, R. M. A., and Bashara, N. M., "SiO₂-Si Film-Substrate Single-Reflection Retarders for Different Mercury Spectral Lines," *Opt. Eng.* **17**, 180-184 (1978).
191. Azzam, R. M. A., "Oblique and Normal-Incidence Photometric Return-Path Ellipsometers for Isotropic and Anisotropic Surfaces," *J. Optics (Paris)* **9**, 131-134 (1978).
192. Azzam, R. M. A., and Zaghoul, A.-R. M., "Determination of the Refractive Index and Thickness of a Transparent Film on a Transparent Substrate from the Angles of Incidence of Zero Reflection-Induced Ellipticity," *Opt. Commun.* **24**, 351-354 (1978).
193. Azzam, R. M. A., "Photopolarimeter Using Two Modulated Optical Rotators," *Optics Lett.* **1**, 181-183 (1977).

194. Azzam, R. M. A., "Return-Path Ellipsometry and a Novel Normal-Incidence Null Ellipsometer (NINE)," *Optica Acta* **24**, 1039- 1049 (1977).
195. Azzam, R. M. A., "Frequency-Mixing Detection of Polarization-Modulated Light Using Different Periodic Analyzers," *Opt. Eng.* **16**, 513-517 (1977).
196. Zaghoul, A.-R. M. and Azzam, R. M. A., "Single-Element Rotating-Polarizer Ellipsometer," *J. Opt. Soc. Am.* **67**, 1286- 1287 (1977).
197. Azzam, R. M. A., "Hybrid Null-Photometric Ellipsometer Using Sinusoidal Optical Rotation," *Optik* **48**, 279-288 (1977).
198. Azzam, R. M. A., and Zaghoul, A.-R. M., "Principal Angle, Principal Azimuth, and Principal-Angle Ellipsometry of Film-Substrate Systems," *J. Opt. Soc. Am.* **67**, 1058-1065 (1977).
199. Azzam, R. M. A., and Zaghoul, A.-R. M., "Polarization-Independent Reflectance Matching (PIRM) - A Technique for the Determination of the Refractive Index and Thickness of Transparent Films," *J. Optics (Paris)* **8**, 201-205 (1977).
200. Zaghoul, A.-R. M., and Azzam, R. M. A., "SiO₂-Si Film-Substrate Reflection Polarizers for Different Mercury Spectral Lines," *Appl. Opt.* **16**, 1488-1489 (1977).
201. Azzam, R. M. A., Rigby, P., and Krueger, J. A., "Kinetics of Protein Adsorption and Immunological Reactions at a Liquid/Solid Interface by Ellipsometry," *Phys. Med. Biol.* **22**, 422- 430 (1977).
202. Azzam, R. M. A., "Polarization Orthogonalization Properties of Optical Systems," *Appl. Phys.* **13**, 281-285 (1977).
203. Azzam, R. M. A., "NIRSE: Normal-Incidence Rotating-Sample Ellipsometer," *Opt. Commun.* **20**, 405-408 (1977).
204. Confer, D. L., Azzam, R. M. A., and Bashara, N. M., "Ellipsometer Nulling: Convergence and Speed," *Appl. Opt.* **15**, 2568-2575 (1976).
205. Azzam, R. M. A., "PIE: Perpendicular-Incidence Ellipsometry - Application to the Determination of the Optical Properties of Uniaxial and Biaxial Absorbing Crystals," *Opt. Commun.* **19**, 122- 124 (1976).
206. Azzam, R. M. A., "An Entoptic Phenomenon and a Theory for its Explanation," *Optik* **45**, 499-502 (1976).
207. Azzam, R. M. A., "Two-Reflection Null Ellipsometer without a Compensator," *J. Phys. E: Sci. Instrum.* **9**, 569-572 (1976).
208. Elshazly-Zaghoul, M., Azzam, R. M. A., and Bashara, N. M., "Explicit Solution for the Optical Properties of a Uniaxial Crystal in Generalized Ellipsometry," *Surface Sci.* **56**, 281-292 (1976).
209. Zaghoul, A.-R. M., Azzam, R. M. A., and Bashara, N. M., "Inversion of the Nonlinear Equations of Reflection Ellipsometry on Film-Substrate Systems," *Surface Sci.* **56**, 87-96 (1976).
210. Azzam, R. M. A., "Alternate Arrangement and Analysis of Systematic Errors for Dynamic Photometric Ellipsometers Employing an Oscillating-Phase Retarder," *Optik* **45**, 209-218 (1976).

211. Azzam, R. M. A., "Use of a Light Beam to Probe the Cell Surface in Vitro," *Surface Sci.* **56**, 126-133 (1976).
212. Azzam, R. M. A., "A Perspective on Ellipsometry," *Surface Sci.* **56**, 6-18 (1976).
213. Azzam, R. M. A., "Frequency-Mixing Detection (FMD) of Polarization-Modulated Light," *J. Opt. Soc. Am.* **66**, 735-739 (1976).
214. Azzam, R. M. A., "Modulated Generalized Ellipsometry," *J. Opt. Soc. Am.* **66**, 520-524 (1976).
215. Azzam, R. M. A., "Oscillating-Analyzer Ellipsometer," *Rev. Sci. Instrum.* **47**, 624-628 (1976).
216. Azzam, R. M. A., "AIDER: Angle-of-Incidence-Derivative Ellipsometry and Reflectometry," *Opt. Commun.* **16**, 153-156 (1976).
217. Azzam, R. M. A., Zaghoul, A.-R. M., and Bashara, N. M., "Design of Film-Substrate Single-Reflection Linear Partial Polarizers," *J. Opt. Soc. Am.* **65**, 1472-1474 (1975).
218. Azzam, R. M. A., Zaghoul, A.-R. M., and Bashara, N. M., "Polarizer-Surface-Analyzer Null Ellipsometry for Film-Substrate Systems," *J. Opt. Soc. Am.* **65**, 1464-1471 (1975).
219. Zaghoul, A.-R. M., Azzam, R. M. A., and Bashara, N. M., "Design of Film-Substrate Single-Reflection Retarders," *J. Opt. Soc. Am.* **65**, 1043-1049 (1975).
220. Bashara, N. M., and Azzam, R. M. A., "Ellipsometry: A Technique for Characterization of Surfaces and Interfaces in Light-Transmitting Ambients," *J. Vac. Sci. Technol.* **12**, 887-890 (1975).
221. Azzam, R. M. A., Elshazly-Zaghoul, M., and Bashara, N. M., "Combined Reflection and Transmission Thin-Film Ellipsometry: A Unified Linear Analysis," *Appl. Opt.* **14**, 1652-1663 (1975).
222. Azzam, R. M. A., and Krueger, J. A., "Tuning a Babinet-Soleil Compensator for Exact Quarter-Wave Retardation in an Ellipsometer," *J. Phys. E: Sci. Instrum.* **8**, 445-446 (1975).
223. Zaghoul, A.-R.M., Azzam, R. M. A., Bashara, N.M., "An-Angle-of-Incidence Tunable SiO₂-Si (Film-Substrate) Reflection Retarder for the UV Mercury Line $\lambda = 2537 \text{ \AA}$," *Opt Commun.* **14**, 260-262 (1975).
224. Azzam, R. M. A., "Polar Curves for Transmission Ellipsometry," *Opt. Commun.* **14**, 145-147 (1975).
225. Azzam, R. M. A., and Bashara, N.M., "Application of Generalized Ellipsometry to Anisotropic Crystals," *J. Opt. Soc. Am.* **65**, 462 (1975).
226. Azzam, R. M. A., Zaghoul, A.-R.M., and Bashara, N.M., "Ellipsometric Function of a Film-Substrate System: Applications to the Design of Reflection-Type Optical Devices and to Ellipsometry," *J. Opt. Soc.* **65**, 252-260 (1975).
227. Azzam, R. M. A., and Bashara, N.M., "Analysis of Systematic Errors in Rotating-Analyzer Ellipsometers," *J. Opt. Soc. Am.* **64**, 1459-1469 (1974).
228. Azzam, R. M. A., and Bashara, N.M., "Determination of the Ratio of Complex Eigenvalues of an Optical System with Known Eigenpolarizations by Ellipsometry," *Optica Acta* **21**, 497-507 (1974).

229. Merrill, B.E., Azzam, R. M. A., and Bashara, N.M., "Numerical Solution for the Evolution of the Ellipse of Polarization in Inhomogeneous Anisotropic Media," *J. Opt. Soc. Am.* **64**, 731-733 (1974).
230. Azzam, R. M. A., and Bashara, N.M., "Average Polarization of Partially Polarized Light," *J. Opt. Soc. Am.* **64**, 398-399 (1974).
231. Azzam, R. M. A., and Bashara, N.M., "Application of Generalized Ellipsometry to Anisotropic Crystals," *J. Opt. Soc. Am.* **64**, 128-132 (1974).
232. Azzam, R. M. A., and Bashara, N.M., "Parametric Equation for the Locus of Invariant-Ellipticity States of an Optical System," *Appl. Opt.* **12**, 2545-2547 (1973).
233. Azzam, R. M. A., and Bashara, N.M., "New Properties of the Complex-Plane Representation of Polarization," *Appl. Phys.* **2**, 59- 61 (1973).
234. Azzam, R. M. A., and Bashara, N.M., "Polarization-Dependent Intensity Transmittance of an Optical System," *Appl. Phys.* **1**, 203-212 (1973).
235. Azzam, R. M. A., Merrill, B.E., and Bashara, N.M., "Trajectories Describing the Evolution of Polarized Light in Homogeneous Anisotropic Media and Liquid Crystals," *Appl. Opt.* **12**, 764-771 (1973).
236. Azzam, R. M. A., and Bashara, N.M., "Separability of Amplitude, Phase, and Polarization Information in the Jones Calculus," *Opt. Commun.* **7**, 317-319 (1973).
237. Azzam, R. M. A., Bundy, T.L., and Bashara, N.M. "The Fixed-Polarizer Nulling Scheme in Generalized Ellipsometry," *Opt. Commun.* **7**, 110-115 (1973).
238. Azzam, R. M. A., and Bashara, N.M., "Loci of Invariant-Azimuth and Invariant-Ellipticity Polarization States of an Optical System," *Appl. Opt.* **12**, 62-67 (1973).
239. Azzam, R. M. A., and Bashara, N.M., "Generalized Ellipsometry for Surfaces with Directional Preference - Application to Diffraction Gratings," *J. Opt. Soc. Am.* **62**, 1521-1523 (1972).
240. Azzam, R. M. A., and Bashara, N.M., "Simplified Approach to the Propagation of Polarized Light in Anisotropic Media - Application to Liquid Crystals," *J. Opt. Soc. Am.* **62**, 1252-1257 (1972).
241. Azzam, R. M. A., and Bashara, N.M., "Bilinear Transformation of Polarization," *J. Opt. Soc. Am.* **62**, 1239 (1972).
242. Azzam, R. M. A., and Bashara, N.M., "Analogy between Linear Optical Systems and Linear Two-Port Electrical Networks," *Appl. Opt.* **11**, 2210-2214 (1972).
243. Azzam, R. M. A., and Bashara, N.M., "Mechano-Optic Polarization Modulator Using a Reflection Diffraction Grating," *Appl. Phys. Lett.* **21**, 222-224 (1972).
244. Azzam, R. M. A., and Bashara, N.M., "The Effect of an Optical System in the Complex-Plane and Poincaré-Sphere Representations," *Opt. Commun.* **5**, 319-322 (1972).
245. Azzam, R. M. A., and Bashara, N.M., "Polarization Characteristics of Scattered Radiation from a Diffraction Grating by Ellipsometry with Application to Surface Roughness," *Phys. Rev.* **B 5**, 4721-4729 (1972).

246. Azzam, R. M. A., and Bashara, N.M., "Choice of Compensator Azimuth and Position in Ellipsometry," *J. Opt. Soc. Am.* **62**, 700-701 (1972).
247. Azzam, R. M. A. and Bashara, N.M., "Spacing of the Multiple Nulls in Generalized Ellipsometry," *Opt. Commun.* **5**, 5-9 (1972).
248. Azzam, R. M. A., and Bashara, N.M., "Ellipsometric Measurement of the Polarization Transfer Function of an Optical System," *J. Opt. Soc. Am.* **62**, 336-340 (1972).
249. Azzam, R. M. A., and Bashara, N.M. , "Polarization Transfer Function of an Optical System as a Bilinear Transformation," *J. Opt. Soc. Am.* **62**, 222-229 (1972).
250. Azzam, R. M. A., and Bashara, N.M., "Equi-Azimuth and Equi- Ellipticity Contour Charts for Ellipsometry," *Surface Sci.* **30**, 101-108 (1972).
251. Azzam, R. M. A., and Bashara, N.M., "Response of an Optical System to Polarization-Modulated Incident Light," *Opt. Commun.* **4**, 203-204 (1971).
252. Azzam, R. M. A., and Bashara, N.M., "Ellipsometry with Imperfect Components Including Incoherent Effects," *J. Opt. Soc. Am.* **61**, 1380-1391 (1971).
253. Azzam, R. M. A., and Bashara, N.M., "Specimen Coherent Scattering and and Compensator Defects Ellipsometry," *J. Opt. Soc. Am.* **61**, 1236-1239 (1971).
254. Azzam, R. M. A., and Bashara, N.M., "Calibration of Ellipsometer Divided Circles," *J. Opt. Soc. Am.* **61**, 1118 (1971).
255. Azzam, R. M. A. , and Bashara, N.M., "General Treatment of the Effect of Cell Windows in Ellipsometry," *J. Opt. Soc. Am.* **61**, 773-776 (1971).
256. Azzam, R. M. A., and Bashara, N.M., "Unified Analysis of Ellipsometry Errors Due to Imperfect Components, Cell-Window Birefringence, and Incorrect Azimuth Angles," *J. Opt. Soc. Am.* **61**, 600-607 (1971).

c. Refereed monographs

R. M. A. Azzam, "Ellipsometer," in *Instruments of Science: An Historical Encyclopedia*, R. Bud and D. Warner, editors, sponsored by the Science Museum of London and the Smithsonian (Garland Publishing, London, 1998), *Invited*.

R. M. A. Azzam and I. A. Bryzgalov, "Ellipsometry and Modulation Spectroscopy," Section 6.7.4 in Vol. 1 of *Advanced Mineralogy*, A. S. Marfunin, editor (Springer-Verlag, Berlin, 1994), *Invited*.

d. Refereed proceedings

1. Howlader, M. M. K., and Azzam, R. M. A., "Negligible Polarization Aberrations of Antireflection-Coated Optical Systems," *Proc. SPIE* **4481**, 58-63 (2002).
2. El-Saba, A. M., and Azzam, R. M. A., "Performance of Reflection Polarizers Using Bare Semiconductor Substrates in the Visible and Near-UV Spectrum," *Proc. SPIE* **4481**, 1-9 (2002).

3. Azzam, R. M. A., "Fast Ellipsometry for *In-Situ* Real-Time Monitoring and Control of Industrial Thin Film Processes," in Proceedings of the International Conference on Industrial Electronics, Technology, and Automation IETA2001 (2001).
4. Liu, J., and Azzam, R. M. A., "Half-Wave Infrared Reflection Retarders Using Two-Dimensional ZnS Surface-Relief Grating on Au Substrate at 45-Degree Angle of Incidence," Proc. SPIE **4133**, 34-43 (2000).
5. El-Saba, A. M., and Azzam, R. M. A., "High-Efficiency All-Dielectric Strip-Coated Beam Splitters for the Equi-Partition of Infrared Input Power," Proc. SPIE **4133**, 24-33 (2000).
6. Azzam, R. M. A., "Ellipsometry: a Sophisticated Tool for Optical Metrology," Proc. SPIE **4099**, 184-196 (2000).
7. Krishnan, S., Hampton, S., Taylor, B., and Azzam, R. M. A., "Spectral Polarization Measurements Using the Grating Division-of-Amplitude Photopolarimeter," in *Diffractive Optics and Micro-Optics*, OSA Technical Digest (Optical Society of America, Washington, DC, 2000), pp. 192-193.
8. El-Saba, A. M., and Azzam, R. M. A., "Design and Analysis of a Beam Splitter for the Equipartition of Infrared Input Power," Proc. SPIE **3754**, 336-345 (1999).
9. El-Saba, A. M., Azzam, R. M. A., Abushagur, M. A. G., Centamore, C. L., and Arp, A. L., "Infrared Parallel-Slab Division-of-Amplitude Photopolarimeter," Proc. SPIE **3754**, 246-259 (1999).
10. Azzam, R. M. A., "Polarization Michelson Interferometer: Principles and Applications," Proc. SPIE **3754**, 162-168 (1999).
11. Azzam, R. M. A., "Correlation of Fresnel's Interface Reflection Coefficients of External and Internal Reflection at the Same Angle of Incidence," Proc. SPIE **3754**, 88-98 (1999).
12. Azzam, R. M. A., and Nazim Uddin, M., "Four-Port Fabry-Perot/Michelson Interferometer: Polarization-Dependent Response and Ellipsometry," Proc. SPIE **3121**, 406-425 (1997).
13. Azzam, R. M. A., "Mueller-Matrix Ellipsometry: A Review," Proc. SPIE **3121**, 396-405 (1997).
14. Azzam, R. M. A., and Howlader, M. M. K., "Infrared Reflection Polarizers Using Uniform and Diffuse Low-Index Layers Buried in High-Index Substrates," Proc. SPIE **2873**, 148-151 (1996).
15. Liu, J., and Azzam, R. M. A., "Field-of-View Analysis of the Four-Detector Photopolarimeter (Stokesmeter)," Proc. SPIE **2873**, 78-81 (1996).
16. Azzam, R. M. A., "Recent Developments of Division-of-Amplitude Photopolarimeters," Proc. SPIE **2873**, 1-4 (1996).
17. Azzam, R. M. A., "Fresnel's Interface Reflection Coefficients for the Parallel and Perpendicular Polarizations: Global Properties and Facts Not Found in your Textbook," SPIE Proc. **2265**, 120-139 (1994).
18. Howlader, M. M. K., and Azzam, R. M. A., "Periodic and Quasiperiodic Nonquarterwave Multilayer Coatings for 90° Reflection Phase Retardance at 45° Angle of Incidence," SPIE Proc. **2265**, 86-98 (1994).

19. Kan'an, A. M., and Azzam, R. M. A., "Principal Angles and Principal Azimuths of an In-Line Three-Reflection Bare-Mirror System: Application to Circular Polarization of VUV Radiation," *SPIE Proc.* **2265**, 9-14 (1994).
20. Azzam, R. M. A., "Multi-Detector Photopolarimeters for Industrial Optical Sensing and Metrology," *SPIE Proc.* **1821**, 270- 283 (1993).
21. Azzam, R. M. A., "High-Efficiency Reflection Polarizers Based on Light Interference in a Buried Low-Index (BLIND) layer in a High-Index Substrate," *SPIE Proc.* **1746**, 367-374 (1992).
22. Azzam, R. M. A., and Angel, W. W., "Transparent Binary-Thickness Coatings on Metal Substrates that Produce Binary Patterns of Orthogonal Elliptical Polarization States in Reflected Light," *SPIE Proc.* **1746**, 157-164 (1992).
23. Azzam, R. M. A., "Diffraction Efficiency of a Grating as a Function of the State of Polarization of Incident Light," in *Diffraction Optics: Design, Fabrication, and Applications Technical Digest*, 1992 (Optical Society of America, Washington, D. C., 1992), Vol. 9, pp. 69-71.
24. Azzam, R. M. A., "An Efficient Calibration Scheme for the Four-Detector Photopolarimeter Using a Rotating Quarter-Wave Retarder," in *Direct and Inverse Methods in Radar Polarimetry*, W.- M. Boerner et. al., Eds. (Kluwer Academic Publishers, Dordrecht, Holland, 1992), 809-818.
25. Azzam, R. M. A. and Pentzke, F. J., "Extrema of the Absolute Value and Argument of a Complex Function of a Real Variable: Application to the Spectral Amplitude and Phase Response of Analog Filter Circuits," in *IEEE Southeastcon '90 Proceedings* (IEEE Catalog No. 90CH2883-7, 1990), pp. 925-928.
26. Azzam, R. M. A., "Integrated Photopolarimeters," *Proc. SPIE* **891**, 42-55 (1988).
27. Azzam, R. M. A. and Thonn, T.F., "Efficient Infrared Reflection Polarizers Using Transparent High-Index Films on Transparent Low-Index Substrates," *Proc. SPIE* **652**, 326-332 (1986).
28. Azzam, R. M. A., "Ellipsometric Methods of Characterization of Optical Thin Films," *Proc. SPIE* **652**, 198-201 (1986).
29. Azzam, R. M. A. and Perilloux, B. E., "Polarized-Light Techniques for Generating Electrical Signals of Controllable Waveform," *Proc. SPIE* **464**, 88-95 (1984).
30. Azzam, R. M. A. and Thonn, T. F., "Three-Reflection Polarizers Using Dielectric-Coated Metallic Mirrors," *Proc. SPIE* **464**, 80-87 (1984).
31. Azzam, R. M. A. and Khan, M. E. R., "MgF₂-Al Film-Substrate Half-Wave Retarder for 0.6328 μm He-Ne Laser Light," in *Proceedings of the International Conference LASERS '82*, R. C. Powell, Ed. (STS Press, McLean, Virginia, 1983), pp. 708-712.
32. Azzam, R. M. A., "Elastic Light Scattering Mueller-Matrix Photopolarimetry," in *Proceeding of the International Conference LASERS '81*, C. B. Collins, Ed. (STS Press, McLean, Virginia, 1982), pp. 554-559.
33. Azzam, R. M. A., "Polarization-Preserving, Single-Layer-Coated, Laser Biconical Reflectors," in *Proceeding of the International Conference LASERS '80*, C. B. Collins, Ed. (STS Press, McLean, Virginia, 1981), pp. 610-614.

34. Azzam, R. M. A. and Zaghloul, A.-R. M., "Characteristics of Polarized Light Reflection from the SiO₂-Si Film-Substrate System," Proc. SPIE **276**, 242-248 (1981).
35. Azzam, R. M. A., "Ellipsometric Configurations and Techniques," Proc. SPIE **276**, 180-187 (1981).
36. Azzam, R. M. A., "Fourier Photoellipsometers and Photopolarimeters Based on Modulated Optical Rotation," Proc. SPIE **112**, 54-57 (1977).
37. Azzam, R. M. A. "Ellipsometry as a Tool for Monitoring Molecular and Cellular Biological Processes in Vitro," Proc. SPIE **88**, 84-88 (1976).
38. Azzam, R. M. A., "Use of Different Periodic Analyzers for the Frequency-Mixing Detection of Polarization-Modulated Light," Proc. SPIE **88**, 11-18 (1976).
39. Azzam, R. M. A., "Biomedical Applications of Ellipsometry," *1976 Region V IEEE Conference Digest*, A. B. Buckman, Ed. (IEEE Press, New York, 1976), 194-197.

C. Other Publications

U. S. Patent No. 5,796,098, August 18, 1998, "Sensor for Rotational Velocity and Rotational Acceleration."

U. S. Patent No. 5,337,146, August 9, 1994 "Diffraction-Grating Photopolarimeters and Spectrophotopolarimeters." (This patent was licensed to Research Corporation Technologies and sublicensed to Containerless Research, Inc.)

U.S. Patent No. 4,725,145, February 16, 1988, "Photodetector Arrangement for Measuring the State of Polarization of Light." (This invention covers the rotating-detector and two-detector ellipsometers. Corresponding Japanese, Canadian, and European patents also issued.)

U.S. Patent No. 4,681,450, July 21, 1987, "Photodetector Arrangement for Measuring the State of Polarization of Light." [This invention was featured in *Lasers and Applications* (September 1985), *Chemical and Engineering News* (July 13, 1987 & October 12, 1992), *Laser Focus World* (March, 1993), *The New York Times* (July 25, 1987), and other newspapers. Corresponding Japanese, Canadian, and European patents also issued.]

U.S. Patent No. 4,306,809, December 22, 1981, "Polarimeter." (This is an instrument for measuring all 16 elements of the Mueller (light- scattering) matrix by Fourier analysis of a single detected signal.)

2. Items Accepted for Publication but Not Yet Published

None.

3. Artistic or Other Creative Contributions

None.

4. Participation at Professional Meetings

(Partial Listing)

1. R. M. A. Azzam, "Polarization Optics of Interfaces and Thin Films," *Plenary lecture* presented at the 4th *International Conference on Spectroscopic Ellipsometry*, Stockholm, Sweden, June 11 – 15, 2007.
2. R. M. A. Azzam, J. Liu, and S. R. Perla, "Remote Sensing Ellipsometry using Corner-Cube Reflectors," Paper presented at the 4th *International Conference on Spectroscopic Ellipsometry*, Stockholm,

Sweden, June 11 – 15, 2007.

3. S. Perla and R. M. A. Azzam, “Embedded centro-symmetric multilayer stacks as complete transmission quarter-wave and half-wave retarders under conditions of frustrated total internal reflection,” paper presented at the Optical Interference Coatings of the Optical Society of America, Tucson, AZ, June 4-7, 2007.
4. S. R. Perla and R. M. A. Azzam, “Wide-Angle, High-Extinction-Ratio, Infrared Polarizing Beam Splitters Using Frustrated Total Internal Reflection by an Embedded Centrosymmetric Multilayer,” paper to be presented at the *OSA Topical Conference on Optical Interference Coatings*, Tucson, AZ, June 4 – 7, 2007.
5. R. M. A. Azzam and C. L. Spinu, “Linear-to-circular polarization transformation upon optical tunneling through an embedded low-index film,” Annual Meeting of the Optical Society of America, Rochester, NY, 29 Sept. - 3 Oct., 2004.
6. R. M. A. Azzam, F. Sudratjat, “Single-layer-coated silicon wedge beam splitter for the division-of-amplitude photopolarimeter,” Annual Meeting of the Optical Society of America, Rochester, NY, 29 Sept. - 3 Oct., 2004.
7. R. M. A. Azzam, F. Sudratjat, and M. Nazim Uddin, “Transmission spectroscopic ellipsometer (TSELL) using prismatic substrates,” 3rd International Conference on Spectroscopic Ellipsometry, Vienna, Austria, 6-11 July, 2003.
8. S. Krishnan, R. M. A. Azzam, and S. Hampton, “Spectroscopic ellipsometry using the grating division-of-amplitude photopolarimeter (G-DOAP),” 3rd International Conference on Spectroscopic Ellipsometry, Vienna, Austria, 6-11 July, 2003.
9. A. De and R. M. A. Azzam, “Optimal coated silicon membrane beam splitters for the division-of-amplitude photopolarimeter,” Annual Meeting of the Optical Society of America, Orlando, FL, 29 Sept.- 3 Oct., 2002.
10. R. M. A. Azzam and C. L. Spinu, “Infrared polarizers and retarders using internal reflection at the Si-SiO₂ interface,” Annual Meeting of the Optical Society of America, Orlando, FL, 29 Sept.- 3 Oct., 2002 **(Invited)**.
11. M. A. Howlader and R. M. A. Azzam, “Negligible polarization aberrations of antireflection-coated optical systems,” 46th Annual Meeting of SPIE - The International Society for Optical Engineering, San Diego, CA, 29 July- 3 Aug., 2001.
12. A.M. El-Saba and R. M. A. Azzam, “Performance of reflection polarizers using bare semiconductor substrates in the visible and near-uv spectrum,” 46th Annual Meeting of SPIE - The International Society for Optical Engineering, San Diego, CA, 29 July- 3 Aug., 2001.
13. R. M. A. Azzam and E. Ugbo, “Reflection of p-polarized light at the surface of an absorbing medium: Range of incidence angle for which the reflection at oblique incidence is less than that at normal incidence,” Annual Meeting of the Optical Society of America, Long Beach, CA, Oct. 14-18 (2001).
14. R. M. A. Azzam and A. De, “Circular polarization beam splitter using embedded symmetric multilayer coating,” Annual Meeting of the Optical Society of America, Long Beach, CA, Oct. 14-18, 2001.
15. R. M. A. Azzam, “Ellipsometry: A sophisticated tool for optical metrology,” SPIE Conference on Optical Metrology Road Map for the Semiconductor Industry, San Diego, CA, July 30-31, 2001. **(Invited)**

16. A. M. El-Saba and R. M. A. Azzam, "High-efficiency all-dielectric strip-coated beam splitters for the equipartition of infrared input power," SPIE Conference on Polarization Measurement, Analysis, and Remote Sensing III, San Diego, CA, 2-3 August 2000.
17. J. Liu and R. M. A. Azzam, "Half-wave infrared reflection retarders using two-dimensional ZnS surface relief grating on Au Substrate at 45-degree angle of incidence," SPIE Conference on Polarization Measurement, Analysis, and Remote Sensing III, San Diego, CA, 2-3 August 2000.
18. S. Krishnan, S. Hampton, B. Taylor, and R. M. A. Azzam, "Spectral polarization measurement using the grating division-of-amplitude photopolarimeter," Optical Society of America Topical Meeting on Diffractive Optics and Micro-Optics, @ Quebec City, Canada, June 18-23, 2000.
19. A.M. El-Saba, R. M. A. Azzam, et. al. "Design and analysis of a beam splitter for the equipartition of infrared input power," SPIE Conference on Polarization Measurement, Analysis, and Remote Sensing II, Denver, CO, July 19-21, 1999.
20. A.M. El-Saba, R. M. A. Azzam, et. al. "Infrared parallel-slab division-of-amplitude photopolarimeter," SPIE Conference on Polarization Measurement, Analysis, and Remote Sensing II, Denver, CO, July 19-21, 1999.
21. R. M. A. Azzam, "Polarization Michelson interferometer: Principles and applications," SPIE Conference on Polarization Measurement, Analysis, and Remote Sensing II, Denver, CO, July 19-21, 1999. **(Invited)**
22. R. M. A. Azzam, "Correlation of Fresnel's interface reflection coefficients of external and internal reflection at the same angle of incidence," SPIE conference on Polarization Measurement, Analysis, and Remote Sensing II, Denver, CO, July 19-21, 1999. **(Invited)**
23. R. M. A. Azzam, "Circular polarization Michelson interferometer," Annual Meeting of the Optical Society of America, Santa Clara, CA, Sept. 28-30, 1999.
24. R. M. A. Azzam, "Application of POLARCOR-type dichroic surface layers for novel and improved polarizing optical elements," 4th Mediterranean Workshop and Topical Meeting on Novel Optical Materials and Applications (NOMA), Cetraro, Italy, June 4-10, 1999.

5. *Other Scholarly or Creativel Activities*

A. Service as Reviewer

Published book reviews in the Journal of the Optical Society of America, Applied Optics, Optics and Photonics News, Physics Today, and Optical Engineering.

Refereed papers for the Journal of the Optical Society of America, Applied Optics, Optics Letters, Optics Express, Optical Engineering, Journal of Modern Optics, European Journal of Pure and Applied Optics, Europhysics Letters, Review of Scientific Instruments, Optics Communications, Journal of Vacuum Science and Technology, Thin Solid Films, American Journal of Physics, Physica Status Solidi, Jordan Journal of Physics, Journal of Lasers and Optics Technology.

Reviewed grant proposals for the National Science Foundation, Research Corporation, State of Louisiana Board of Regents, and the Petroleum Research Fund.

Reviewed book proposals for North-Holland, Springer-Verlag, and Academic Press.

External Ph. D. thesis examiner, University of Alabama-Huntsville, Université Laval (Québec, Canada), Université de Neuchâtel (Switzerland), University of Sofia (Bulgaria), Ain Shams University (Cairo, Egypt), and Andhra University (India).

Consultant, Ph. D. Program in Electro-Optics, University of Dayton, 1990.

B. Service to Professional Organizations

Member, *Honorary Committee*, 5th International Conference on Spectroscopic Ellipsometry, Albany, New York, May 23-28, 2010.

Member, *Publications Council*, Optical Society of America, Washington, D. C., 2004-2010.

Membership Advisory Committee, *Engineering Sciences and Technologies*, Academy of Sciences of the Developing World (TWAS, Trieste, Italy), 2004-2009.

Member, *International Advisory Board*, Jordan Journal of Physics, 2008 – present.

Member, *Paul Drude Award Committee*, 4th International Conference on Spectroscopic Ellipsometry, Stockholm, Sweden, June 2007.

Member, *Ad Hoc Committee to Review the Journal of the Optical Society of America A*, 1991-1992.

Chairman, *1987 Max Born Award Committee*; Member of the 1984, 1985, 1986, and 1988 Max Born Award Committees of the Optical Society of America.

Extensive involvement in national and international conferences as listed below:

1. Member, Steering Committee, 6th *International Conference on High-Capacity Optical Networks and Enabling Technologies*, sponsored by the IEEE and IEEE Communications Society, Alexandria, Egypt, December 28-30, 2009.
2. Participated in the 19th *General Conference of the Academy of Sciences of the Developing World (TWAS)*, Mexico City, November 10-13, 2008, at the invitation of the Mexican Academy of Sciences.
3. Member, Program Committee and Plenary Speaker, 4th *International Conference on Spectroscopic Ellipsometry*, Stockholm, Sweden, June 11 – 15, 2007.
4. Participant, *Doha Forum for Democracy, Development and Free Trade* (invited by the Ambassador of Qatar to the US), Doha, Qatar, April 23-25, 2007.
5. Participant, *Optical Society of America Winter Leadership Conference*, Washington, D. C., February 7-10, 2007.
6. Participated in the 10th *General Conference of the Academy of Sciences of the Developing World (TWAS)*, Rio de Janeiro, Brazil, September 2 – 7, 2006, at the invitation of the Brazilian Academy of Sciences.
7. Member, International Steering Committee and Invited Keynote Speaker, *JAPMED4, 4th Japanese-Mediterranean Workshop on Applied Electromagnetic Engineering for Magnetic*,

- Superconducting, and Nano Materials*, El Gezireh Hotel, Cairo, Egypt, September 17-20, 2005. (I could not attend this conference because of Hurricane Katrina.)
8. Invited guest, *Einstein Symposium*, 2005 World Year of Physics Celebration, Bibliotheca Alexandrina, June 4-6, 2005, Alexandria, Egypt.
 9. Guest Scientist, *First National Conference on Scientific Research*, Cairo, Egypt, May 27-28, 2005, invited by the Egyptian Academy of Scientific Research and Technology.
 10. Participant, *TWAS 9th General Conference*, Beijing, China (October 15-19, 2003), as guest of the Chinese Academy of Sciences; invited guest, Tsinghua University (Beijing) and Fudan University (Shanghai), October 20-22, 2003.
 11. Member, Program Committee and Session Chair, *Third International Conference on Spectroscopic Ellipsometry*, Vienna, Austria, July 6 - 11. 2003.
 12. Member, Program Committee, *Polarization Measurement, Analysis, and Applications V*, Seattle, Washington, July 7 - 11, 2002.
 13. Member, Program Committee, *Polarization Analysis and Measurement IV*, San Diego, California, July 29 - August 3, 2001.
 14. Member, Program Committee, *Polarization Measurement, Analysis, and Remote Sensing III*, San Diego, California, July 30 - August 4, 2000.
 15. Member, Program Committee, Session Chair, and Invited Speaker, *Polarization Measurement, Analysis, and Remote Sensing II*, Denver, Colorado, July 19-21, 1999.
 16. Member, Program Committee, *Second International Conference on Spectroscopic Ellipsometry*, Charleston, South Carolina, May 12-15, 1997.
 17. Keynote Speaker and Session Chair, *International Symposium on Polarization Analysis and Applications to Device Technology*, Yokohama, Japan, June 12-14, 1996.
 18. Invited Speaker, *International Conference on Metallurgical Coatings and Thin Films*, San Diego, California, April 24-28, 1995.
 19. Invited Tutorial on *Ellipsometry*, *Annual Meeting of the Optical Society of America*, Dallas, Texas, October 2-7, 1994.
 20. Member, Program Committee, Invited Speaker, and Session Chair, *Polarization Analysis and Measurement II*, SPIE International Symposium on Optics, Imaging and Instrumentation, San Diego, California, July 24-29, 1994.
 21. Member, International Advisory Committee, Invited Speaker, and Session Chair, *First International Conference on Spectroscopic Ellipsometry*, Paris, France, January 11-14, 1993.
 22. Member, Program Committee, lead Invited Speaker, and Session Chair, *Polarization Analysis and Measurement*, SPIE International Symposium on Optical Applied Science and Engineering, San Diego, California, July 19-24, 1992.
 23. Member, Program Committee, Session Chair, Panelist, and Short-Course Instructor, *Polarimetry: Radar, Infrared, Visible, Ultraviolet, X-Ray*, SPIE Conference, Huntsville, Alabama, May 14-17, 1990.

24. Session Chair, *Annual Meeting of the Optical Society of America*, Orlando, Florida, October 15-20, 1989.
25. Member, Program Committee, and Chair of two sessions, *Polarization Considerations for Optical Systems II*, SPIE 33rd Annual International Symposium on Optical & Optoelectronic Applied Science and Engineering San Diego, California, August 9-11, 1989.
26. Member, Program Committee, Organizer and Chair of the *Symposium on Applications of Polarimetry*. Instructor, short course on *Ellipsometry*, Annual Meeting of the Optical Society of America, Santa Clara, California, October 31 - November 4, 1988.
27. Session Chair, *Optical Interference Coatings Topical Meeting*, Optical Society of America, Tucson, Arizona, April 12-15, 1988.
28. Member, Program Committee, Opening Session Chair, and Invited Speaker, *Polarization Considerations for Optical Systems*, SPIE-The International Society for Optical Engineering, Los Angeles, California, January 10-15, 1988.
29. Invited Speaker and Session Chair, *7th International Conference on Thin Films*, New Delhi, India, December 7-11, 1987.
30. Panelist, *Thin Film Technologies II*, SPIE-The International Society for Optical Engineering, Innsbruck, Austria, April 15-17, 1986.
31. Conference Co-Chair, Co-organizer, and Session Chair, *Solid State Optical Control Devices*, Society of Photo-Optical Instrumentation Engineers, Los Angeles, California, January 26-27, 1984.
32. Session Chair and Panelist, *Annual Meeting of the Optical Society of America*, New Orleans, Louisiana, October 17-20, 1983.
33. Member, International Scientific Committee, *International Conference on Ellipsometry and Other Optical Methods for Surface and Thin-Film Analysis*, Paris, France, June 7-10, 1983.
34. Member, Conference Committee, Session Organizer and Chair, *Fifth International Conference on Lasers & Applications (LASERS '82)*, New Orleans, Louisiana, December 13-17, 1982.
35. Member, Conference Committee, Session Co-Organizer and Co-Chair, *Fourth International Conference on Lasers & Applications (LASERS '81)*, New Orleans, Louisiana, December 14-18, 1981.
36. Member, Conference Committee, Session Organizer and Chair, *Third International Conference on Lasers & Applications (LASERS '80)*, New Orleans, Louisiana, December 15-19, 1980.
37. Co-Organizer, *Fourth International Conference on Ellipsometry*, Lawrence Berkeley Laboratory, University of California, Berkeley, California, August 20-22, 1979.
38. Co-Chair and Co-Organizer, *SPIE Conference on Optical Polarimetry*, Society of Photo-Optical Instrumentation Engineers, San Diego, California, August 23-24, 1977.
39. Co-Chair and Co-Organizer, *SPIE Conference on Polarized Light*, Society of Photo-Optical Instrumentation Engineers, San Diego, California, August 24-25, 1976.
40. Organizer, *Third International Conference on Ellipsometry*, Lincoln, Nebraska, September 23-25, 1975.

C. Journal Editorship

**Topical Editor*, Polarization Optics, Applied Optics (Published by the Optical Society of America), 1993-1999.

**Topical Editor*, Polarization and Thin Films, Journal of the Optical Society of America A, 1984-1989.

D. Professional society membership

Fellow, Optical Society of America

Fellow, SPIE - The International Society of Optical Engineering

Associate Fellow, TWAS - Academy of Sciences of the Developing World, Trieste, Italy

6. Awards, Lectureships, or Prizes

2005 *G. G. Stokes Award* of SPIE – The International Society for Optical Engineering, for exceptional contributions to the field of optical polarization.

1993 *Photonics Circle of Excellence Award* for the StokesMeter, an instrument for measuring light polarization, manufactured by Gaertner Scientific Corporation of Chicago, Illinois.

1993 *R&D 100 AWARD* for the StokesMeter, R&D Magazine, October, 1993.

1988 *Outstanding American Inventor and Finalist*, America's Inventor of the Year Award, Intellectual Property Owners (IPO), Inc., Washington, D.C., for the invention of the four-detector photopolarimeter. This instrument was described as "among the most outstanding recent American inventions," by Donald W. Banner, former President of IPO and former U.S. Commissioner of Patents and Trademarks.

Fulbright Senior Research Scholar, France, September 1985-July 1986.

Citation for Outstanding Service, Society of Photo-Optical Instrumentation Engineers, 1977 and 1978.

Invited speaker at universities (Louisiana State University, University of Arizona, University of Colorado, University of Alabama-Huntsville, University of South Alabama, Alabama A & M University, University of Central Florida (CREOL), Université de Québec à Trois Rivières, Université de Provence-Marseille, Université de Luminy-Marseille, Université de Neuchâtel-Switzerland, Ecole Polytechnique Fédérale de Lausanne-Switzerland, Uppsala University, Sweden, University of Linköping, Sweden), and Corporate and Research Laboratories (Michelson Laboratory, Research Corporation, Coherent, 3M, KLA-Tencor, Vought Corporation, ENEA- Italy and others).

Invited lecturer as a Fulbright Scholar, Department of Electrical Engineering, Imperial College of Science and Technology, London, England, June 30-July 4, 1986.

Listed in WHO'S WHO IN TECHNOLOGY, WHO'S WHO IN ENGINEERING, AMERICAN MEN AND WOMEN OF SCIENCE, MARQUIS INTERNATIONAL WHO'S WHO IN OPTICAL SCIENCES AND ENGINEERING, WHO'S WHO IN AMERICAN EDUCATION, WHO'S WHO IN THE SOUTH AND SOUTHWEST, WHO'S WHO IN THE WORLD.

Thousands of citations of published work in more than a 100 top science and engineering journals, 1975-2009.

7. Grants and Contracts

a. Principal investigator or co-principal investigator

\$248,846: National Science Foundation, DMR-9301313, *Development of Time-Resolved and Spectroscopic Ellipsometry using Grating Diffraction*, 1993-1997 (Principal Investigator).

\$221,086: EPRI/Entergy, *Optical Monitoring of Insulator Surface Contamination*, 1993-1996 (Principal Investigator).

\$67,789: Louisiana Education Quality Support Fund, Contract No. LEQSF (1991-93)-RD-A-35, *In-Line Fiber-Optic Photopolarimeters* (Principal Investigator).

\$153,879: National Science Foundation, Grant No. ECS-8520035, 1986-1990, *Integrated Photopolarimeters: Development and Applications* (Principal Investigator).

\$5,000: Lambrecht Research Technology Partners (Chicago, Illinois), 1989, an award to develop software for the four-detector photopolarimeter.

\$358,000: State of Louisiana Board of Regents, 1987, *A Computing System for Teaching, Research, and Economic Development* (Co-Principal Investigator).

\$46,000: State of Louisiana Board of Regents and Foundation for A Better Louisiana, 1983-1984, *Optical Characterization Techniques for Integrated Circuit Fabrication* (Principal Investigator).

\$128,775: National Science Foundation, Grant No. DMR-8018417, 1981-1983, *Angle-of-Incidence-Derivative Ellipsometry and Reflectometry* (Principal Investigator).

b. Other

\$1,000,000: Containerless Research, Inc. (Evanston, IL), NSF *SBIR Phase I and Phase II Contracts and the State of Illinois: Real Time Spectroscopic Ellipsometer for Thin Film Process Control*, 1997-2002 (Consultant). This research was based on patented UNO Technology licensed to CRI.

\$108,000: National Science Foundation, Grant No. INT78-00373, 1978-1981, Cairo University, *Ellipsometry of Film-Substrate Systems* (Co-author of proposal and Cooperating U.S. Scientist).

8. Thesis/Dissertation Committee Service

Hazem Khanfar, *Polarizing optical devices using subwavelength-structured one-dimensional photonic crystal layer embedded in a prism*, Ph. D. dissertation, major professor, December 2009 (expected).

Shibalik Chakraborty, *Determination of Mueller matrix elements in the presence of imperfections in optical components*, M. Sc. thesis, major professor, May 2009.

Siva Perla, *Multilayer polarization optical devices based on frustrated total internal reflection*, Ph. D. dissertation, major professor, June 2007.

Faisal Sudradjat, *50 % - 50 % beam splitters using transparent substrates coated by single- or double-layer quarter-wave thin films*, M. Sc. thesis, major professor, May 2006.

9. *Major Areas of Creative or Research Interest*

Innovative optical instruments, design of optical coatings, ellipsometry and optical polarimetry, theory of light reflection by interfaces and thin films, surface science, and technology transfer.

10. *Other Professional Accomplishments*

- A. In progress.
- B. Introduced and taught three 6000-level courses in optics (ENEE 6563, ENEE 6564, and ENEE 6565) and one senior/graduate optics course ENEE 4562.
- C. None.
- D. a. Graduate Coordinator, Electrical Engineering Department; Chair, EE Faculty Search Committee; invited speaker at the UNO Physics Department Einstein Symposium.
- E. Service to the Optical Society of America and TWAS as already noted in Item 5 above.