

## ISAO NODA

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Education: D.Sc. (Chemistry), March 1997  
The University of Tokyo  
Ph.D. (Chemical Engineering), February 1979  
Columbia University in the City of New York  
M.Phil. (Chemical Engineering), May 1978  
Columbia University in the City of New York  
M.S. (Bioengineering), May 1976  
Columbia University in the City of New York  
B.S. (Chemical Engineering), May 1974  
Columbia University in the City of New York

Affiliations: American Chemical Society  
American Institute of Chemical Engineers  
American Physical Society  
Coblentz Society  
IR-Raman Society, Japan  
Optical Society of America  
Phi Lambda Upsilon

Sigma Xi  
Society for Applied Spectroscopy  
Society of Polymer Science, Japan

Employment:

Meridian Holdings Group, Inc.	2013 to date
University of Delaware	2012 to date
The Procter & Gamble Company	1978 to 2012

## Honors

1. 1991 William F. Meggers Award from the Society for Applied Spectroscopy presented at 19th Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, Anaheim, CA, October 8, 1991.
2. 2002 Williams-Wright Award from the Coblenz Society presented at Pittsburgh Conference (Pittcon 2002), New Orleans, LA, March 19, 2002.
3. 2005 Cincinnati Chemist of the Year Award from the Cincinnati Section of the American Chemical Society, Cincinnati, OH, February 16, 2005.
4. International Academic Cooperation and Exchange Medal from Chinese Chemical Society and Chinese Optical Society presented at 15<sup>th</sup> National Conference on Molecular Spectroscopy, Beijing, China, October 19, 2008.
5. 2009 Gold Medal from the New York Section of the Society for Applied Spectroscopy presented at Eastern Analytical Symposium and Exposition, Somerset, NJ, November 18, 2009.
6. 2011 Bomem-Michelson Award from the Coblenz Society presented at Pittcon 2011, Atlanta GA, March 15, 2011.
7. 2011 Ellis R. Lippincott Award from the Optical Society of America, the Coblenz Society, and the Society for Applied Spectroscopy presented at FACSS 2011, Reno, NC, October 5, 2011.

## Appointments

1. Editorial Board, *Journal of Applied Polymer Science*
2. Editorial Board *Journal of Environmental Polymer Degradation*
3. Organizing Committee Secretary, *International Symposium on Advanced Infrared Spectroscopy (AIRS) I*
4. Advisory Board, University of Connecticut, Polymer Science Program.
5. Organizing Committee, *International Symposium on Advanced Infrared Spectroscopy (AIRS) II*
6. International Organizing Committee, *12th European Symposium on Polymer Spectroscopy*

7. Organizing Committee, *International Symposium on Advanced Infrared Spectroscopy (AIRS) III*
8. Organizing Committee, Co-Chairman, *International Symposium on Two-Dimensional Spectroscopy (2DCOS)*
9. Organizing Committee, *James E. Mark Symposium on Emerging Opportunities in Polymer Technologies*
10. Advisory Board for Scientific Content, *Joint meeting of 6<sup>th</sup> International Workshop on Biodegradable Polymers and Plastics and 9<sup>th</sup> Annual Meetings of BEDPS*
11. External Steering Committee, Department of Chemical Engineering and Applied Chemistry, Columbia University in the City of New York.
12. Organizing Committee, Co-Chairman, *2nd International Symposium on Two-Dimensional Spectroscopy (2DCOS II)*
13. Honorary Adjunct Professor, Department of Biology, Tsinghua University, Beijing, China.
14. International Advisory Committee, *International Conference on Bio-based Polymers*
15. Advisory Committee, 3rd International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-III).
16. Guest Research Staff, Research Center for Environment Friendly Polymers, Kwansai Gakuin University, Japan.
17. Williams-Wright Award Committee, the Coblenz Society.
18. International Advisory Committee, 4<sup>th</sup> International and 2<sup>nd</sup> Asian regional Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-2007).
19. Editorial Board, *Journal of Spectroscopy and Spectral Analysis*.
20. Editorial Board, *Journal of Molecular Structure*.
21. Fellow of the Society for Applied Spectroscopy.
22. Fellow of the Optical Society of America.
23. Honorary Member of the Society for Applied Spectroscopy.

24. Honorary Guest Professor, Department of Chemistry, Peking University, Beijing, China.

## Granted U. S. Patents

1. I. Noda and D.F. Hager, "Latex compositions capable of producing elastomers with hydrophilic surfaces," U.S. Patent 4 734 445, March 29, 1988.
2. I. Noda, "Selectively surface-hydrophilic porous or perforated sheets," U.S. Patent 4 735 843, April 5, 1988.
3. I. Noda, and D. F. Hager, "Cationic latex compositions capable of producing elastomers with hydrophilic surfaces," U.S. Patent 4 785 030, Nov. 15, 1988.
4. I. Noda, and D. F. Hager, "Cationic latex compositions capable of producing elastomers with hydrophilic surfaces," U.S. Patent 4 835 211, May 30, 1989.
5. I. Noda, "Disposable sanitary articles," U.S. Patent 5 015 245, May 14, 1991.
6. I. Noda, "Polycationic esterified latex precursors having polymerizable unsaturated groups," U.S. Patent 5 122 577, June 16, 1992.
7. I. Noda, "Paper with polycationic latex strength agent," U.S. Patent 5,200,036, Apr. 6, 1993.
8. I. Noda, "Absorbent structures from mixed furnishes," U.S. Patent 5,200,037, Apr. 6, 1993.
9. I. Noda, "Polycationic latex wet strength agent," U.S. Patent 5,342,875, Aug. 30, 1994.
10. A. D. Shine, S. D. Smith, and I. Noda, "Preparation of homogeneous polymers using supercritical fluid solutions," U.S. Patent 5,412,027, May 2, 1995.
11. I. Noda, "Biodegradable copolymers and plastic articles comprising biodegradable copolymers," U.S. Patent 5,489,470, Feb. 6, 1996.
12. I. Noda, "Biodegradable copolymers and plastic articles comprising biodegradable copolymers," U.S. Patent 5,498,692, Mar. 12, 1996.
13. I. Noda, "Biodegradable copolymers and plastic articles comprising biodegradable copolymers of 3-hydroxyhexanoate," U.S. Patent 5,502,116, Mar. 26, 1996.
14. I. Noda, "Biodegradable copolymers and plastic articles comprising biodegradable copolymers of 3-hydroxyhexanoate," U.S. Patent 5,536,564, Jul. 16, 1996.
15. A. D. Shine, S. D. Smith, and I. Noda, "Preparation of homogeneous polymers using supercritical fluid solutions," U.S. Patent 5,567,769, Oct.22, 1996.

16. I. Noda, "Biodegradable copolymers," U.S. Patent 5,602,227, Feb. 11, 1997. Reissued as U.S. Patent RE 36,548, Feb. 1, 2000.
17. I. Noda, "Biodegradable copolymers and plastic articles comprising biodegradable copolymers," U.S. Patent 5,618,855, April 8, 1997.
18. I. Noda, R. A. Lampe, and M. M. Satkowski, "Spray processes using a gaseous flow for preparing biodegradable fibrils, nonwoven fabrics comprising biodegradable fibrils, and articles comprising such nonwoven fabrics," U.S. Patent 5,653,930, Aug. 5, 1997.
19. I. Noda, "Nonwoven material comprising fibers and an adhesive comprising polyhydroxyalkanoate," U.S. Patent 5,685,756, November 11, 1997.
20. I. Noda, "Nonwoven material comprising biodegradable copolymers," U.S. Patent 5,747,584, May 5, 1998.
21. I. Noda, R. A. Lampe, and M. M. Satkowski, "Spray processes using a gaseous flow for preparing biodegradable fibrils, nonwoven fabrics comprising biodegradable fibrils, and articles comprising such nonwoven fabrics," U.S. Patent 5,780,368, Jul. 14, 1998.
22. I. Noda, "Solvent extraction of polyhydroxyalkanoates from biomass facilitated by the use of marginal nonsolvent," U.S. Patent 5,821,299, Oct. 13, 1998.
23. I. Noda, "Process for isolation of polyhydroxyalkanoates using air classification," U.S. Patent 5,849,854, Dec. 15, 1998.
24. I. Noda, "Process for recovering polyhydroxyalkanoates using centrifugal fractionation," U.S. Patent 5,899,339, May 4, 1999.
25. I. Noda, "Process for recovering polyhydroxyalkanoates using centrifugal fractionation," U.S. Patent 5,918,747, July 6, 1999.
26. I. Noda and L. A. Schechtman, "Solvent extraction of polyhydroxyalkanoates from biomass," U.S. Patent 5,942,597, Aug. 24, 1999.
27. I. Noda, "Films and absorbent articles comprising a biodegradable polyhydroxyalkanoate comprising 3-hydroxybutyrate and 3-hydroxyhexanoate comonomer units," U.S. Patent 5,990,271, Nov. 23, 1999.
28. I. Noda, "Fibers, nonwoven fabrics, and absorbent articles comprising a biodegradable polyhydroxyalkanoate comprising 3-hydroxybutyrate and 3-hydroxyhexanoate," U.S. Patent 6,013,590, January 11, 2000.
29. I. Noda, "Films and absorbent articles comprising a biodegradable polyhydroxyalkanoate comprising 3-hydroxybutyrate and 3-hydroxyhexanoate comonomer units," U.S. Patent 6,027,787, February 22, 2000.

30. I. Noda, "Biodegradable PHA copolymers," U.S. Patent 6,077,931, June 20, 2000.
31. I. Noda, "Fibers, nonwoven fabrics and absorbent articles comprising a biodegradable polyhydroxyalkanoate comprising 3-hydroxybutyrate and 3-hydroxyhexanoate comonomer units," U.S. Patent 6,143,947, November 7, 2000.
32. I. Noda, "Absorbent articles comprising a biodegradable PHA copolymers," U.S. Patent 6,160,199, December 12, 2000.
33. I. Noda, "Films comprising a biodegradable PHA copolymers," U.S. Patent 6,174,990 B1, January 16, 2001.
34. I. Noda, "Plastic articles comprising biodegradable PHA copolymers," U.S. Patent 6,569,990 B1, May 27, 2003.
35. I. Noda, S.B. Gross, H.J. O'Donnell, J.C. Horney, and M.D. Midkiff, "Disposable absorbent products and methods of manufacture and use," U.S. Patent 6,670,521 B2, Dec. 30, 2003.
36. I. Noda and W. M. Allen, Jr., "Grinding process for plastic material and compositions therefrom," U.S. Patent 6,699,963 B2, Mar. 2, 2004.
37. J.J. Zhao, I. Noda, G.W. Gilbertson, D.C. McAvoy, B.F. Gray, and D.H. Melik, "Molded of extruded articles comprising polyhydroxyalkanoate copolymer compositions having short annealing cycle times," US Patent 6,706,942 B1, Mar. 16, 2004.
38. E.B. Bond, J.-P.M. Autran, L.N. Mackey, I. Noda, H.J. O'Donnell, and D.V. Phan, "Multicomponent fibers comprising starch and polymers," US Patent 6,746,766 B2, Jun. 8, 2004.
39. D.H. Melik and I. Noda, "Polymer products comprising soft and elastic biodegradable polyhydroxyalkanoate copolymer compositions and methods of preparing such polymer products," US Patent 6,794,023 B1, Sep. 21, 2004.
40. I. Noda, E.B. Bond, and D.H. Melik, "Polyhydroxyalkanoate copolymer and polylactic acid polymer compositions for laminates and films," US Patent 6,808,795 B2, Oct. 26, 2004.
41. E.B. Bond, J.-P. M. Autran, L.N. Mckey, I. Noda, H.J. O'Donnell, and D.V. Phan, "Fibers comprising starch and polymers," US Patent 6,818,295 B2, Nov. 16, 2004.
42. D.H. Melik and I. Noda, "Methods for preparing soft and elastic biodegradable polyhydroxyalkanoate copolymer compositions and polymer products comprising such compositions," US Patent 6,821,612 B1, Nov. 23, 2004.

43. I. Noda, "Plastic articles digestible by hot alkaline treatment," US Patent 6,872,802 B1, Mar. 29, 2005.
44. E.B. Bond, J.-P. M. Autran, L.N. Mckey, I. Noda, and H.J. O'Donnell, "Fibers comprising starch and biodegradable polymers," US Patent 6,890,872 B2, May 10, 2005.
45. I. Noda and M.M. Satkowski, "Agricultural items and agricultural methods comprising biodegradable copolymers," US Patent 6,903,053 B2, June 7, 2005.
46. I. Noda, E.B. Bond, and D.H. Melik, "Fibers comprising polyhydroxyalkanoate copolymer/polylactic acid polymer or copolymer blends," US Patent 6,905,987 B2, June 14, 2005.
47. E.B. Bond, J.-P. M. Autran, L.N. Mckey, I. Noda, and H.J. O'Donnell, "Fibers comprising starch and biodegradable polymers," US Patent 6,946,506 B2, Sep. 20, 2005.
48. E.B. Bond and I. Noda, "Polyhydroxyalkanoate copolymer/starch compositions for laminates and films," US Patent 7,077,994 B2, Jul. 18, 2006.
49. J.J. Zhao, I. Noda, G.W. Gilbertson, D.C. McAvoy, B.F. Gray, and D.H. Melik, "Molded or extruded articles comprising polyhydroxyalkanoate copolymer and an environmentally degradable thermoplastic polymer," US Patent 7,098,292 B2, Aug. 29, 2006.
50. K. Kinoshita, F. Osakada, Y. Ueda, K. Narasimhan, A.C. Cearley, K. Yee, and I. Noda, "Method for producing polyhydroxyalkanoate crystal," US Patent 7,098,298 B2, Aug. 29, 2006.
51. K. Narasimhan, I. Noda, M.M. Satkowski, A.C. Cearley, M.S. Gibson, S.J. Welling, "Process for the extraction of polyhydroxyalkanoates from biomass," US Patent 7,118,897 B2, Oct. 10, 2006.
52. K. Kinoshita, F. Osakada, Y. Ueda, K. Narasimhan, A.C. Cearley, K. Yee, and I. Noda, "Method for producing polyhydroxyalkanoate crystal," US Patent 7,153,928 B2, Dec. 26 2006.
53. I. Noda, M.M. Satkowski, and G.C. Ames, "Method of and items for reducing latex exposure," US Patent 7,166,343 B2, Jan. 23, 2007.
54. I. Noda, S.B. Gross, and H.J. O'Donnell, "Dispersible absorbent products having a multi-layered structure and methods of manufacture and use," US Patent 7,838,725 B2, Nov. 23, 2007.

55. E.B. Bond, J.-P. M. Autran, L.N. Mckey, I. Noda, and H.J. O'Donnell, "Multicomponent fibers comprising starch and polymers," US Patent 7,851,391 B2, Dec. 14, 2010.
56. I. Noda, M.M. Satkowski, W.M. Allen, Jr., J.T. Knapmeyer, "Water stable compositions and articles comprising starch and methods of making the same," US Patent 8,435, 354 B2, May 7, 2013.
57. I. Noda, M.M. Satkowski, W.M. Allen, Jr., J.T. Knapmeyer, "Water stable compositions and articles comprising starch and methods of making the same," US Patent 8,530,557 B2, September 10, 2013.

## Granted European Patents

1. I. Noda, "Selectively surface-hydrophilic porous or perforated sheets," EP 0 272 118 B1, July 21, 1993.
2. I. Noda, "Absorbent structures from mixed furnishes," EP 0 343 850 B1, July 20, 1994.
3. I. Noda, "Disposable sanitary articles," EP 0 527 152 B1, February 26, 1997.
4. I. Noda, "Process for recovering polyhydroxyalkanoates using air classification," EP 0 763 125 B1, July 21, 1999.
5. I. Noda, "Process for recovering polyhydroxyalkanoates using centrifugal fractionation," EP 0 763 126 B1, July 21, 1999.
6. I. Noda, R.A. Lampe, and M.M. Satkowski, "Spray processes using a gaseous flow for preparing biodegradable fibrils," EP 0 748 398 B1, July 28, 1999.
7. I. Noda, "Films and absorbent articles comprising a biodegradable polyhydroxyalkanoate comprising 3-hydroxybutyrate and 3-hydroxyhexanoate," EP 0 741 757 B1, May 24, 2000.
8. I. Noda, "Anionic latex composition having surface hydrophilicity," EP 0 799 258 B1, March 21, 2001.
9. I. Noda, "Nonwoven materials comprising biodegradable copolymers," EP 0 839 170 B1, October 17, 2001.
10. I. Noda, R.A. Lampe, and M.M. Satkowski, "Stirring processes for preparing biodegradable fibrils," EP 0 748 399 B1, May 15, 2002.
11. I. Noda, "Solvent extraction of polyhydroxyalkanoates from biomass facilitated by the use of a marginal nonsolvent for PHA," EP 0 846 184 B1, May 22, 2002.
12. I. Noda and L.A. Schechtman, "Process for recovering polyhydroxyalkanoates using Air Classification," EP 0 871 761 B1, October 23, 2002.
13. I. Noda, "Biodegradable copolymers and plastic articles comprising biodegradable copolymers," EP 0 739 368 B1, February 26, 2003.
14. I. Noda, "Films comprising biodegradable PHA copolymers," EP 1 141 099 B1, April 2, 2003.
15. I. Noda, "Absorbent articles comprising biodegradable PHA copolymers," EP 1 140 232 B1, July 27, 2005.

16. I. Noda, "Biodegradable copolymers and plastic articles comprising biodegradable copolymers of 3-hydroxyhexanoate," EP 0 741 753 B1, December 28, 2005.
17. I. Noda, "Plastic articles comprising biodegradable PHA copolymers," EP 1 140 231 B1, February 22, 2006.
18. I. Noda, "Biodegradable PHA copolymers," EP 1 141 075 B1, March 5, 2006.
19. I. Noda, "Nonwoven materials comprising biodegradable copolymers," EP 1 132 446 B1, August 23, 2006.
20. I. Noda, M.M. Satkowski, and G.C. Ames, "Glove comprising a polyhydroxyalkanoate," EP 1 292 629 B1, August 30, 2006.
21. I. Noda, S.B. Gross, H.J. O'Donnell, J.C. Horney, and M.D. Midkiff, "Dispersible absorbent products and methods of manufacture and use," EP 1 333 868 B1, March 21, 2007.
22. E.B. Bond, J.P.M. Autran, L.N. Mackey, I. Noda, and H.J. O'Donnell, "Multicomponent fibers comprising starch and biodegradable polymers," EP 1 397 538 B1, August 15, 2007.
23. E.B. Bond, J.P.M. Autran, L.N. Mackey, I. Noda, and H.J. O'Donnell, "Multicomponent fibers comprising starch and polymers," EP 1 397 539 B1, August 15, 2007.
24. E.B. Bond, J.P.M. Autran, L.N. Mackey, I. Noda, H.J. O'Donnell, and D.V. Phan, "Fibers comprising starch and polymers," EP 1 397 536 B1, October 17, 2007.
25. E.B. Bond, J.P.M. Autran, L.N. Mackey, I. Noda, and H.J. O'Donnell, "Fibers comprising starch and biodegradable polymers," EP 1 397 537 B1, January 9, 2008.
26. J.J. Zhao, I. Noda, G.W. Gilbertson, D.C. McAvoy, B.F. Gray, and D.H. Melik, "Molded articles comprising polyhydroxyalkanoate copolymer and an environmentally degradable thermoplastic polymer," EP 1 620 507 B1, February 13, 2008.
27. E.B. Bond and I. Noda, "Polyhydroxyalkanoate copolymer/starch compositions for laminates and films," EP 1 436 350 B1, March 25, 2009.
28. I. Noda, M.M. Satkowski, W.M. Allen, and J.T. Knapmeyer, "Water stable compositions and articles comprising starch and methods of making the same," EP 1 934 280 B1, July 8, 2009.
29. E.B. Bond, D.V. Phan, H.J. O'Donnell, I. Noda, L.N. Mackey, and J.-P.M. Autran, "Process for the production of multicomponent fibers comprising a dissolvable starch component," EP 1 563 129 B1, July 15, 2009.

30. K. Kinoshita, F. Osakada, Y. Ueda, K. Narasimhan, A.C. Cearley, K. Yee, and I. Noda, "Process for producing polyhydroxyalkanoate crystal," EP 1 688 450 B1, September 16, 2009.
31. I. Noda and M.M. Satkowski, "Use of biodegradable plastic food service items," EP 1 242 497 B1, September 30, 2009.
32. I. Noda, M.M. Satkowski, W.M. Allen, J.T. Knapmeyer. "Water stable fibers and articles comprising starch, and methods of making the same," EP 1 934 389 B1, November 25, 2009.
33. I. Noda, M.M. Satkowski, W.M. Allen, J.T. Knapmeyer. "Water stable compositions and articles comprising starch and methods of making the same," EP 1 937 768 B1, September 15, 2010.
34. I. Noda, M.M. Satkowski, W.M. Allen, J.T. Knapmeyer. "Water stable fibers and articles comprising starch, and methods of making the same," EP 1 934 390 B1, April 13, 2011.
35. I. Noda, E.B. Bond, D.H. Melik, "Fibers comprising polyhydroxyalkanoate copolymer/polylactic acid polymer or copolymer blends," EP 1 381 720 B1, September 5, 2012.

## Publications

(Refereed)

1. I. Noda and C.C. Gryte, "Mass transfer in regular array of hollow fibers in countercurrent dialysis," *AIChE J.* **25**(1), 113-22 (1979).
2. I. Noda and C.C. Gryte, "Effect of flow maldistribution on hollow fiber dialysis -- Experimental studies," *J. Membr. Sci.* **5**(2), 209-25 (1979).
3. I. Noda and C.C. Gryte, "Composite separation units and their application in dialysis for the isolation of intermediate-sized molecules," *Chem. Eng. Sci.* **35**(7), 1545-56 (1980).
4. I. Noda and C.C. Gryte, "Multistage membrane separation processes for the continuous fractionation of solutes having similar permeabilities," *AIChE J.* **27**(6), 904-912 (1981).
5. I. Noda, A.E. Dowrey, and C. Marcott, "Dynamic infrared linear dichroism of polymer films under oscillatory deformation," *J. Polym. Sci., Polym. Lett. Ed.* **21**, 99-103 (1983).
6. H. Tong, I. Noda, and C.C. Gryte, "Formation of anisotropic ice-agar composites by directional freezing," *Colloid Polym. Sci.* **262**, 589-595 (1984).
7. I. Noda, A.E. Dowrey, and C. Marcott, "Characterization of polymers using polarization-modulation infrared technique. Dynamic infrared linear dichroism (DIRLD) spectroscopy," in *Fourier Transform Infrared Characterization of Polymers* edited by H. Ishida (Plenum, New York, 1987), pp.33-59.
8. I. Noda, A.E. Dowrey, and C. Marcott, "A spectrometer for measuring time-resolved infrared linear dichroism induced by a small-amplitude oscillatory strain," *Appl. Spectrosc.* **42**(2), 203-216 (1988).
9. I. Noda, A.E. Dowrey, and C. Marcott, "Two-dimensional infrared (2D IR) spectroscopy. A new tool for interpreting infrared spectra," *Mikrochim. Acta [Wien]* **I**, 101-103 (1988).
10. I. Noda, "Two-dimensional infrared (2D IR) spectroscopy," *J. Am. Chem. Soc.* **111**(21), 8116-8118, (1989).
11. I. Noda, "Two-dimensional IR spectroscopy," *Kobunshi [Highpolymers, Japan]* **39**(3), 214-217 (1990).
12. I. Noda, S.D. Smith, A.E. Dowrey, J.T. Grothaus, and C. Marcott, "Dynamic IR studies of microdomain interphases of isotope-labeled block copolymers," *Mat. Res. Soc. Symp. Proc.* **171**, 117-122, (1990).

13. I. Noda, "Two-dimensional infrared (2D IR) spectroscopy. Theory and applications," *Appl. Spectrosc.* **44**(4), 550-561 (1990).
14. I. Noda, "Two-dimensional correlation approach to the dynamic rheo-optical characterization of polymers," *Chemtracts-Macromol. Chem.* **1**(2), 89-105 (1990).
15. I. Noda, A.E. Dowrey, and C. Marcott, "Dynamic infrared dichroism study of high-density and low-density polyethylene near the  $\beta$ -transition temperature," *J. Molec. Struct.* **224**, 265-270 (1990).
16. R.A. Palmer, C.J. Manning, J.L. Chao, I. Noda, A.E. Dowrey, and C. Marcott, "Application of step-scan interferometry to two-dimensional Fourier transform infrared (2D FT-IR) correlation spectroscopy," *Appl. Spectrosc.* **45**(1), 12-17 (1991).
17. I. Noda, "Latex elastomer with a permanently hydrophilic surface," *Nature* **350**(6314), 143-144 (March 14, 1991).
18. I. Noda, A.E. Dowrey, and C. Marcott, "Two-dimensional correlation infrared spectroscopy," *Oyo Buturi* **60**(10), 1039-1340 (1991).
19. C. Marcott, I. Noda, and A.E. Dowrey, "Enhancing the information content of vibrational spectra through sample perturbation," *Analytica Chim. Acta* **250**, 131-143 (1991).
20. I. Noda, "Plastics and rubbers with water-wettable surfaces," *Chem. Ind.* No. 20, 749-752 (1991).
21. I. Noda, "Contact-angle studies of surface-hydrophilic elastomer films," *J. Adhesion Sci. Technol.* **6**(4), 467-475, (1992).
22. A. Haas, I. Noda, L.A. Schechtman, and Y. Talmon, "Cryo-TEM and DSC characterization of latexes stabilized with surface active block oligomers," *Polymer* **33**(10), 2043-2050, (1992).
23. I. Noda, A.E. Dowrey, and C. Marcott, "Two-dimensional infrared (2D IR) spectroscopy based on a time-resolved IR measurement," in *Time-Resolved Vibrational Spectroscopy V*, (Springer-Verlag, 1992) pp.331-334.
24. I. Noda, "Surface-hydrophilic elastomers," in *Polymer Blends, Solutions, and Interfaces (Proc. Procter & Gamble UERP Symp.)*, I. Noda and D. N. Rubingh, Eds., pp.1-21, Elsevier: New York, 1992.

25. S.D. Smith, I. Noda, C. Marcott, and A.E. Dowrey, "Investigation of the polymer interphase via synthesis of well-defined copolymers," in *Polymer Solutions, Blends, and Interfaces (Proc. Procter & Gamble UERP Symp.)*, I. Noda and D. N. Rubingh, Eds., pp.43-64, Elsevier: New York, 1992.
26. M.M. Satkowski, J.T. Grothaus, S.D. Smith, A. Ashraf, C. Marcott, A. Dowrey, and I. Noda, "Study of blends with narrow molecular-weight distribution: Hydrogen- and deuterium-labeled poly(styrene) and poly(vinyl methylether)," in *Polymer Solutions, Blends, and Interfaces (Proc. Procter & Gamble UERP Symp.)*, I. Noda and D. N. Rubingh, Eds., pp.89-108, Elsevier: New York, 1992.
27. R.S. Stein, M.M. Satkowski, and I. Noda, "Nature of crystal/amorphous interface in polyethylene and its blends," in *Polymer Solutions, Blends, and Interfaces (Proc. Procter & Gamble UERP Symp.)*, I. Noda and D. N. Rubingh, Eds., pp.109-131., Elsevier: New York, 1992.
28. I. Noda, A.E. Dowrey, and C. Marcott, "Dynamic infrared linear dichroism (DIRLD) spectroscopy: A versatile characterization technique for polymers," *Polym. News* **18**(6), 167-173 (1993).
29. I. Noda, A.E. Dowrey, and C. Marcott, "Submolecular dynamics of amorphous polymers probed by two-dimensional infrared (2D IR) spectroscopy," *Makromol. Chem., Macromol. Symp.* **7**, 121-129 (1993).
30. I. Noda, A.E. Dowrey, and C. Marcott, "Recent developments in two-dimensional infrared (2D IR) correlation spectroscopy," *Appl. Spectrosc.* **47**(9), 1317-1323 (1993).
31. C. Marcott, A.E. Dowrey, and I. Noda, "Instrumental aspects of dynamic two-dimensional infrared spectroscopy," *Appl. Spectrosc.* **47**(9), 1324-1328 (1993).
32. I. Noda, "A generalized two-dimensional correlation method applicable to infrared, Raman, and other types of spectroscopy," *Appl. Spectrosc.* **47**(9), 1329-1336 (1993).
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346. I. Noda, "Two-dimensional correlation spectroscopy," in *Infrared and Raman Spectroscopy of Polymers*, T. Nishioka, Ed., pp.101-117, Kodansha, Tokyo, 2015.
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348. D.-Q. Gao, X.-P. Li, J.-J. Shi, X.-Y. Kang, T.-G. Kang, J.-M. Xia, X.-F. Ling, S.-F. Weng, Y.-Z. Xu, I. Noda, J.-G. Wu, "Two-dimensional correlation spectroscopic studies on coordination between carbonyl group of butanone and metal ions," *Chin. Chem Lett.* **26**(2), 177-181 (2015)
349. Y.-H. Liu, J.-J. Shi, D.-Q. Gao, Y.-L. Gao, R. Guo, X.-F. Ling, S.-F. Weng, Y.-Z. Xu, I. Noda, J.-G. Wu, "Interactions between oxyridinium and  $\text{Nd}^{3+}$ ," *Chin. Chem Lett.* **26**(2), 182-186 (2015).
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## Books

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2. Y. Ozaki and I. Noda, Eds. *Two-Dimensional Correlation Spectroscopy*, AIP Conference Proceedings **503**, AIP: Melville, 2000.
3. I. Noda and Y. Ozaki, *Two-Dimensional Correlation Spectroscopy — Applications in Vibrational and Optical Spectroscopy*, Wiley: Chichester, UK, 2004.

## Conference Presentations

(Presented by Noda)

1. I. Noda and C.C. Gryte, "Permeability spectrum of selective dialysis networks," Symposium on Polymer Research at New York and New Jersey Universities, New Jersey Section ACS, Seton Hall University, Oct. 1976.
2. I. Noda, "Dynamic infrared linear dichroism of polymers under oscillatory deformations," 1st SPSJ International Conference, Kyoto, Japan, Aug. 21, 1984.
3. I. Noda and C. Marcott, "Characterization of polymers using polarization-modulation infrared techniques," Meeting of the American Chemical Society, Philadelphia PA, August 29, 1984.
4. I. Noda, A.E. Dowrey, and C. Marcott, "Submolecular relaxation phenomena of polymers near the glass transition temperature," March Meeting of the American Physical Society, Las Vegas NV, April 1, 1986.
5. I. Noda, "Two-dimensional infrared (2D IR) spectroscopy of synthetic and biopolymers," March Meeting of the American Physical Society, Las Vegas NV, Apr. 2, 1986. [Poster]
6. I. Noda, "Two-dimensional infrared (2D IR) spectroscopy," 13th Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, St. Louis MO, October 3, 1986.
7. I. Noda, A.E. Dowrey, and C. Marcott, "Physical aging of polymeric glass studied at submolecular level," March Meeting of the American Physical Society, New York NY, March 17, 1987.
8. I. Noda, A.E. Dowrey, C. Marcott, M. Ree, and R. S. Stein, "Dynamic infrared dichroism studies of deuterium-labeled polyethylene blends," March Meeting of the American Physical Society, New Orleans LA, March 21, 1988.
9. I. Noda, A.E. Dowrey, and C. Marcott, "Submolecular interactions of polymers studied by two-dimensional infrared (2D IR) spectroscopy," March Meeting of the American Physical Society, New Orleans LA, March 23, 1988. [Poster]
10. I. Noda, A.E. Dowrey, and C. Marcott, "Dynamic infrared linear dichroism (DIRLD) and two-dimensional infrared (2D IR) analysis of polymers," IUPAC 32nd International Symposium on Macromolecules, Kyoto, Japan, August 3, 1988.
11. I. Noda, "Dynamic infrared linear dichroism," Penn State Polymer Symposium, University Park PA, October 17, 1988. [Invited]

12. I. Noda, S.D. Smith, and C. Marcott, "Dynamic IR studies of microdomain interphases of isotopically labeled block copolymers," Fall Meeting of the Materials Research Society, Boston, MA, November 27, 1989. [Selected for the Most Outstanding Contributed Paper Award of the symposium]
13. I. Noda, A.E. Dowrey, and C. Marcott, "Two-dimensional infrared (2D IR) analysis of poly(methyl methacrylate)," 199th National Meeting of the American Chemical Society, Boston, MA, April 25, 1990.
14. I. Noda, S.D. Smith, and C. Marcott, "Dynamic dichroism and two-dimensional infrared analysis of block copolymers," Macro'90, 33rd IUPAC Symposium on Macromolecules, Montreal, Quebec, Canada, July 11, 1990.
15. I. Noda, A.E. Dowrey, and C. Marcott, "Two-dimensional infrared (2D IR) spectroscopy of block copolymers," 9th European Symposium on Polymer Spectroscopy, Köln, Germany, September 25, 1990. [Poster]
16. I. Noda, "Two-dimensional infrared (2D IR) spectroscopy," 9th European Symposium on Polymer Spectroscopy, Köln, Germany, September 26, 1990. [Invited]
17. I. Noda, A.E. Dowrey, and C. Marcott, "Two-dimensional correlation analysis of dynamic infrared dichroism," Society of Polymer Science Japan 39th Symposium on Macromolecules, Nagoya, Japan, October 18, 1990.
18. I. Noda, "Two-dimensional infrared (2D IR) spectroscopy," Raman Infrared Analytical Conference, Tokyo, Japan, October 26, 1990. [Invited]
19. I. Noda, A.E. Dowrey, and C. Marcott, "Two-dimensional infrared (2D IR) analysis of poly(hydroxyalkanoates)," International Symposium on Biodegradable Polymers, Tokyo, Japan, October 30, 1990.
20. I. Noda, S.D. Smith, A.E. Dowrey, and C. Marcott, "Two-dimensional infrared studies of miscible polymer blends," March Meeting of the American Physical Society, Cincinnati OH, March 1991.
21. I. Noda, "Two-dimensional infrared spectroscopy," 40th Annual Meeting of the Society of Polymer Science Japan, Kyoto, Japan, May 1991. [Invited]
22. I. Noda, A. E. Dowrey, and C. Marcott, "Two-dimensional infrared (2D IR) spectroscopy based on a time-resolved IR measurement," 5th International Conference on Time-Resolved Vibrational Spectroscopy, Tokyo, Japan, June 1991. [Invited]
23. I. Noda, "Surface-hydrophilic elastomers," 202nd ACS National Meeting, New York, August 26, 1991.

24. I. Noda, "Two-dimensional infrared (2D IR) spectroscopy," 202nd ACS National Meeting, New York, August 28, 1991. [Invited]
25. I. Noda, A.E. Dowrey, C. Marcott, "Dynamic infrared linear dichroism of polymers," 202nd ACS National Meeting, New York, August 29, 1991. [Invited]
26. I. Noda, "Two-dimensional infrared spectroscopy. Theory and applications," '92 Bio-Rad Seminar on 2D/Time-Resolved FT-IR, Tokyo, Japan, March 18, 1992 and Osaka, Japan, March 24, 1992. [Invited]
27. I. Noda, A.E. Dowrey, and C. Marcott, "Dynamics of polymers near the glass-transition temperature probed at the submolecular scale," 203rd ACS National Meeting, San Francisco, April 6, 1992. [Invited]
28. I. Noda, "Contact-angle studies of surface-hydrophilic elastomer films," 203rd ACS National Meeting, San Francisco, April 7, 1992. [Invited]
29. I. Noda, "Permanent hydrophilization of latex elastomer surfaces with an amphiphilic block copolymer," 41st Annual Meeting of Soc. Polymer Science, Japan, Yokohama, Japan, May 27, 1992.
30. I. Noda, A.E. Dowrey, and C. Marcott, "Two-dimensional infrared (2D IR) studies of submolecular-level dynamics of polymers," 5th International Symp. on Polymer Analysis and Characterization, Inuyama, Japan, June 3, 1992. [Invited]
31. I. Noda, A.E. Dowrey, and C. Marcott, "Submolecular dynamics of amorphous polymers probed by two-dimensional infrared (2D IR) spectroscopy," 10th European Symposium on Polymer Spectroscopy, St. Petersburg, Russia, Sept. 29, 1992. [Invited]
32. I. Noda, A.E. Dowrey, and C. Marcott, "Two-dimensional infrared (2D IR) studies of submolecular dynamics of polymers," 4th European Polymer Federation Symposium on Polymeric Materials, Baden-Baden, Germany, Oct. 1, 1992. [Invited]
33. I. Noda, "Two-dimensional infrared spectroscopy applied to extreme state chemistry," Symposium on Extreme State Chemistry, Tokyo, Japan, Dec. 10, 1992. [Invited]
34. I. Noda, "Dynamic 2D IR spectroscopy. How it all began," Pittsburgh Conference, Atlanta, GA, Mar. 11, 1993. [Invited]
35. I. Noda, A.E. Dowrey, and C. Marcott, "Recent developments in two-dimensional infrared correlation spectroscopy," First International Symposium on Advanced Infrared Spectroscopy, Tokyo, Japan, Mar. 23, 1993. [Invited]

36. I. Noda, "Generalized two-dimensional correlation spectroscopy," First International Symposium on Advanced Infrared Spectroscopy, Tokyo, Japan, Mar. 24, 1993. [Poster]
37. I. Noda, "Biodegradable polymers and their blends Studied by 2D IR spectroscopy," the First Gordon Research Conference on Biodegradable Polymers, San Miniato, Italy, May 3, 1993. [Invited]
38. I. Noda, "Two-dimensional infrared spectroscopy," 30th Seminar Program for Research Associates of the Department of Chemistry, University of Cincinnati, Cincinnati, June 15, 1993. [Invited]
39. I. Noda, "Application of dynamic dichroism and 2D IR spectroscopy in polymer characterization," SPSJ 42nd Symposium on Macromolecules, Tokyo, Japan, Sept. 21, 1993. [Invited]
40. I. Noda, G.M. Story, C. Marcott, "Multicomponent polymeric systems studied by depth-profiling Fourier transform infrared photoacoustic spectroscopy (FT-IR PAS) Coupled with Two-Dimensional Correlation Analysis," IUPAC MacroAkron'94, Akron OH, July 14, 1994.
41. I. Noda, "Dynamic 2D IR spectroscopy," 21st Annual Conf. FACSS, St. Louis, October 4, 1994. [Invited]
42. I. Noda, "Solid waste disposal considerations for environmentally responsible materials," Symposium on Horizons for Environmentally Conscious Polymer Engineering," Storrs CT, May 18, 1995. [Invited]
43. I. Noda, A.E. Dowrey, G.M. Story, and C. Marcott, "Depth profiling and dynamic studies of polymers using phase resolved infrared spectroscopy," 22nd Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, Cincinnati, OH, Oct. 18, 1995.
44. I. Noda, "Computational aspects of generalized two-dimensional correlation spectroscopy," the Second International Symposium on Advanced Infrared Spectroscopy, Durham, NC, Jun. 17, 1996. [Poster]
45. I. Noda, G.M. Story, A.E. Dowrey, R.C. Reeder, and C. Marcott, "Applications of two-dimensional correlation spectroscopy in depth-profiling photoacoustic spectroscopy, dynamic IR and near IR dichroism, and spectroscopic micro imaging," the 12th European Symposium on Polymer Spectroscopy, Lyon, Jul. 10, 1996. [Invited]
46. I. Noda, "Two-dimensional correlation analysis," Pre-Symposium Intensive Course, 3rd International Symposium on Advanced Infrared and Raman Spectroscopy, Vienna, Austria, July 5, 1998. [Invited]

47. I. Noda, G. M. Story, and C. Marcott, "Pressure and temperature induced transitions of polymers studied by two-dimensional infrared (2D IR) correlation spectroscopy," 3rd International Symposium on Advanced Infrared and Raman Spectroscopy, Vienna, Austria, July 6, 1998. [Poster]
48. I. Noda, "New developments and future of two-dimensional correlation spectroscopy," 2DCOS Pre-symposium, Nishinomiya, Japan, Sep. 5, 1998. [Invited]
49. I. Noda, A.E. Dowrey, and C. Marcott, "Thermally induced physical transition processes of polyhydroxyalkanoates studies by two-dimensional infrared (2D IR) correlation spectroscopy," International Symposium on Biological Polyhydroxyalkanoates '98, Wako-shi, Japan, Sep. 9, 1998.
50. I. Noda, A.E. Dowrey, G.M. Story, and C. Marcott, "2D spectroscopy," 12th International Conference on Fourier Transform Spectroscopy, Tokyo, Japan, Aug. 26, 1999. [Invited]
51. I. Noda, "Progress in 2D correlation spectroscopy," International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS), Kobe-Sanda, Japan, Aug. 29, 1999. [Plenary Lecture]
52. I. Noda, "Recent mathematical developments in 2D correlation spectroscopy," International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS), Kobe-Sanda, Japan, Aug. 30, 1999. [Poster]
53. I. Noda, "Synchronicity, non-linearity, and two-dimensional correlation spectroscopy," Int. Symp. Spectral Analysis Methods in Vib. Spectrosc. (ISSAM-VS), Nishinomiya, Japan, Jul. 22, 2000. [Invited]
54. I. Noda, "Theory and applications of generalized 2-D correlation spectroscopy," PITTCON 2001, New Orleans, LA, Mar. 6, 2001. [Invited]
55. I. Noda, "Two-dimensional correlation spectroscopy," IR- Raman Section Symposium, Spectroscopical Society of Japan, Osaka, Japan, Oct. 12, 2001. [Invited]
56. I. Noda, "Nodax™—Procter & Gamble's novel polyhydroxyalkanoates," Ecomaterials Section Symposium, Society of Polymer Science Japan, Karuizawa, Japan, Oct. 18, 2001. [Invited]
57. I. Noda, "Introduction to two-dimensional infrared (2D IR) correlation spectroscopy," The First Chinese Symposium on Two-Dimensional Infrared Correlation Spectroscopy, Beijing, China, Feb. 23, 2002. [Invited]
58. I. Noda, "Recent advances in two-dimensional (2D) correlation spectroscopy," The First Chinese Symposium on Two-Dimensional Infrared Correlation Spectroscopy, Beijing, China, Feb. 23, 2002. [Invited]

59. I. Noda, "Nodax<sup>TM</sup>—Procter & Gamble's novel polyhydroxyalkanoates," First Chinese Symposium on Two-Dimensional Infrared Correlation Spectroscopy, Beijing, China, Feb. 24, 2002. [Invited]
60. I. Noda, "Two-dimensional infrared correlation spectroscopy study of the crystallization behavior of Nodax<sup>TM</sup>," First Chinese Symposium on Two-Dimensional Infrared Correlation Spectroscopy, Beijing, China, Feb. 24, 2002. [Invited]
61. I. Noda, "Dynamic dichroism and 2D IR spectroscopy," PITTCON 2002, New Orleans, LA, Mar. 19, 2002. [Award Lecture, the Coblentz Society 2002 Williams-Write Award]
62. I. Noda and N.S. McDonald, "*NODAX<sup>TM</sup>* — Procter and Gamble's novel polyhydroxyalkanoates," 10<sup>th</sup> Annual Meeting of the BioEnvironmental Polymer Society, Albuquerque, NH, September 12, 2002. [Invited]
63. I. Noda, "Two-dimensional (2D) correlation analysis and chemometrics in vibrational spectroscopy," 29<sup>th</sup> Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Providence, RI, October 14, 2002. [Invited]
64. I. Noda, "Recent advances in 2D correlation spectroscopy," 29<sup>th</sup> Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Providence, RI, October 18, 2002. [Invited]
65. I. Noda, "*NODAX<sup>TM</sup>* — Procter and Gamble's novel polyhydroxyalkanoates," ICS-UNIDO Symposium on Sustainable Development and Environmentally Degradable Plastics in China, Beijing China, October 25, 2002. [Invited]
66. I. Noda, M.M. Satkowski, D.H. Melik, E.B. Bond, P.R. Green, and N.S. McDonald "*NODAX<sup>TM</sup>* from Procter and Gamble — Biodegradable thermoplastics from renewable resources," ICS-UNIDO Symposium on Sustainable Development and Environmentally Degradable Plastics in China, Beijing China, October 26, 2002. [Poster]
67. I. Noda, "Advances in 2D correlation spectroscopy," Chinese Raman, FT-IR 2D Correlation Analysis Forum, Beijing China, October 28, 2002. [Invited]
68. I. Noda, "Nodax<sup>TM</sup> combines the performance of plastics with environmental sustainability," Sustainable Development and Biodegradable Materials International Conference, Annual Conference of Environmentally Biodegradable Polymer Association, Taichung, Taiwan, December 13, 2002. [Invited]
69. I. Noda, "Selected topics in 2D correlation spectroscopy," International Mini-symposium on 2D Correlation Spectroscopy, Sanda, Japan, March 26, 2003. [Invited]

70. I. Noda, "Advances in two-dimensional correlation spectroscopy," 2<sup>nd</sup> International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-II), Nottingham, UK, Aug. 21, 2003. [Plenary Lecture]
71. I. Noda, K. Izawa, and H. Okabayashi, "Two-dimensional correlation gel permeation chromatography (2D GPC). A novel application of 2D correlation concept to chromatographic studies," 2<sup>nd</sup> International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-II), Nottingham, UK, Aug. 21, 2003. [Poster]
72. I. Noda, "Graphical representation of two-dimensional (2D) correlation in vector space," 2<sup>nd</sup> International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-II), Nottingham, UK, Aug. 21, 2003. [Poster]
73. I. Noda, A.E. Dowrey, and C. Marcott, "Two-dimensional infrared (2D IR) correlation spectroscopy study of biodegradable plastics," 2<sup>nd</sup> International Conference on Advanced Vibrational Spectroscopy (ICAVS-2), Nottingham, UK, Aug. 25, 2003. [Poster]
74. I. Noda, E.B. Bond, P.R. Green, D.H. Melik, K. Narasimhan, and M.M. Satkowski, "Preparation, properties, and utilization of bio-based biodegradable Nodax<sup>TM</sup> PHA copolymers," 226<sup>th</sup> National Meeting of the Am. Chem. Soc. (ACS), New York, NY, Sep. 9, 2003.
75. I. Noda, M.M. Satkowski, E.B. Bond, D.H. Melik, C. Marcott, P.R. Green, and K. Narasimhan, "The production and properties of Nodax<sup>TM</sup> PHA copolymers," 1<sup>st</sup> IUPAC international Conference on Bio-based Polymers (ICBP2003), Wako-shi, Japan, Nov. 12, 2003.
76. I. Noda, "Bio-based biodegradable plastics – Nodax<sup>TM</sup>," the 1st Kwansei Gakuin Polymer Symposium, Sanda, Japan, May 28, 2004. [Invited]
77. I. Noda, M.M. Satkowski, E.B. Bond, D.H. Melik, K. Narasimhan, and P.R. Green, "Nodax<sup>TM</sup> PHA copolymers and their blends," the 8<sup>th</sup> World Conference on Biodegradable Polymers and Plastics (BDDP8), Seoul, Korea, June 2, 2004. [Invited]
78. I. Noda, "Model-based 2D correlation spectroscopy," the 1<sup>st</sup> Asian Symposium on Two-Dimensional Correlation Spectroscopy (AS-2DCOS-1), Kyungju, Korea, June 7, 2004. [Plenary Lecture]
79. I. Noda, "2D correlation analysis of local optical axis resolved spectra (LOARS)," the 1<sup>st</sup> Asian Symposium on Two-Dimensional Correlation Spectroscopy (AS-2DCOS-1), Kyungju, Korea, June 7, 2004. [Poster]

80. I. Noda, P.R. Green, M.M. Satkowski, and L.A. Schechtman, "Nodax™ PHA copolymers," Int. Symp. Bio. Polyesters (ISBP 2004), Beijing, China, August 25, 2004. [Invited]
81. I. Noda, A.E. Dowrey, C. Marcott, M.M. Satkowski, "Two-dimensional infrared (2D IR) correlation spectroscopy study of biodegradable polymers," 31<sup>st</sup> Meeting of Federation of Anal. Chem. Spectrosc. Soc. (31<sup>st</sup> FACSS), Portland, Oregon, October 4, 2004. [Invited]
82. I. Noda, W.M. Allen, A.E. Dowrey, C. and Marcott, "Local optical axis resolved spectroscopy (LOARS)," 31<sup>st</sup> Meeting of Federation of Anal. Chem. Spectrosc. Soc. (31<sup>st</sup> FACSS), Portland, Oregon, October 7, 2004. [Poster]
83. I. Noda, "Two-dimensional infrared (2D IR) study of polymers, biomolecules, and other interesting systems," Meeting of the Cincinnati Section of the American Chemical Society, Cincinnati, Ohio, February 16, 2005. [Award Lecture, 2005 Cincinnati Chemist of the Year]
84. I. Noda, "Nodax™ – Biodegradable plastics made from renewable resources," Symposium on Innovations at the Interface of Polymers and Biology, Polytechnic Univ., Brooklyn, New York, May 10, 2005. [Invited]
85. I. Noda, "Continuing progress in two-dimensional correlation spectroscopy," 3<sup>rd</sup> International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-3), Delavan, Wisconsin, August 12, 2005. [Invited]
86. I. Noda, "Asynchronous paradox. Apparent breakdown of Noda's rules," 3<sup>rd</sup> International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-3), Delavan, Wisconsin, August 13, 2005. [Poster]
87. I. Noda, "Asynchronous kernel matrix," 3<sup>rd</sup> International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-3), Delavan, Wisconsin, August 13, 2005. [Poster]
88. I. Noda and W.M. Allen, "2D correlation analysis of local optical axis resolved spectra of biodegradable plastics," 3<sup>rd</sup> International Conference on Advanced Vibrational Spectroscopy (ICAVS-3), Delavan, Wisconsin, August 18, 2005. [Poster]
89. I. Noda, "Pearls of microbes – biodegradable plastics from renewable resources," 1<sup>st</sup> International Symposium of Research Center for Environment Friendly Polymers (RCEFP), Nishinomiya, Japan, October 25, 2005. [Invited]
90. I. Noda, A.E. Dowrey, and C. Marcott, "Glass transition of atactic polystyrene probed at submolecular level by dynamic IR linear dichroism (DIRLD) spectroscopy," 231<sup>st</sup> National Meeting of the Am. Chem. Soc. (ACS), Atlanta, GA, Mar. 27, 2006. [Invited].

91. I. Noda, "Two-dimensional infrared (2D IR) correlation spectroscopy study of bioplastics," European Seminar on Infrared Spectroscopy (ESIS 2006), Lyon, France, April 4, 2006. [Invited]
92. I. Noda, W.M. Allen, and S.E. Lindberg, "2D Raman study of emulsion copolymerization reaction," National Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) and Society for Applied Spectroscopy (SAS), Lake Buena Vista, FL, September 25, 2006. [Invited]
93. Y. Hu, B.Y. Li, H. Sato, and Y. Ozaki, "Noise perturbation in functional principal component analysis filtering for two-dimensional correlation spectroscopy: its theory and application to infrared spectra of a pol(3-hydroxybutyrate) thin film," National Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) and Society for Applied Spectroscopy (SAS), Lake Buena Vista, FL, September 25, 2006.
94. I. Noda, "Recent advancement in the field of two-dimensional correlation spectroscopy," 4th International Symposium and 2<sup>nd</sup> Asian Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-2007), Beijing, China, August 17, 2007. [Invited]
95. I. Noda, "Frontiers of 2D Correlation Spectroscopy," National Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, October 1, 2008. [Invited]
96. I. Noda, "Two-dimensional correlation spectroscopy — A decade of fruitful collaboration and friendship in China," 15<sup>th</sup> National Conference on Molecular Spectroscopy, Beijing, China, October 18, 2008. [Award Lecture]
97. I. Noda, "Two-dimensional correlation spectroscopy study of biomolecules," National 2DCOS Symposium, Rincón, Puerto Rico, February 20, 2009. [Plenary Lecture]
98. I. Noda, "Applications of two-dimensional correlation spectroscopy in bio molecular studies," The 1<sup>st</sup> Chubu 2DCOS Mini-Symposium, Nagoya, Japan, July 10, 2009. [Special Lecture]
99. I. Noda, "Two-dimensional correlation spectroscopy — the next generation," The 5<sup>th</sup> International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-5), Wrocław, Poland, August 5, 2009. [Invited]
100. I. Noda, "Applications of two-dimensional correlation spectroscopy (2DCOS)," Eastern Analytical Symposium and Exposition, Somerset, NJ, November 18, 2009. [Award Lecture]

101. I. Noda, "Projection two-dimensional correlation spectroscopy," 37<sup>th</sup> Annual Conference of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Raleigh, NC, October 20, 2010.
102. I. Noda, "Computational aspect of two-dimensional correlation spectroscopy," 37<sup>th</sup> Annual Conference of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Raleigh, NC, October 21, 2010. [Invited]
103. I. Noda, "Two-dimensional infrared (2D IR) correlation spectroscopy — progress in a quarter century," Pittcon 2011, Atlanta, GA, March 15, 2011. [Award Lecture]
104. I. Noda, "2D correlation spectroscopy — 25 years of progress and beyond," 2DCOS-6, Sonoma County, CA, June 10, 2011. [Plenary Lecture]
105. X. Li, J. Chen, C. Zhang, J. Qi, Y. Liu, Y. Xu, I. Noda, and J. Wu, "An overview on the orthogonal sample design approaches in two-dimensional spectra to probe intermolecular interactions," 2DCOS-6, Sonoma County, CA, June 12, 2011.
106. Y. Xu, H. Zhou, A. He, I. Noda, K. Huang, and J. Wu, "Spectroscopic investigations on the superconcentrated HCl, HNO<sub>3</sub> and aqua regia," ICAVS-6, Sonoma County, CA, June 16, 2011. [Poster]
107. I. Noda, "Infrared spectroscopy and world sustainability — Development of bio-based biodegradable plastics," 38<sup>th</sup> Annual Conference of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, October 4, 2011. [Invited]
108. I. Noda, "The evolution of two-dimensional infrared (2D IR) correlation spectroscopy," 38<sup>th</sup> Annual Conference of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS), Reno, NV, October 6, 2011. [Award Lecture]
109. I. Noda, "Two-dimensional correlation spectroscopy — past, present, and future," 2012 Kwansai Gakuin University Mini Symposium, Sanda, Japan, June 21, 2012. [Invited]
110. I. Noda, "Resolution enhancement in 2D correlation spectroscopy," SciX 2012, Kansas City, MO, October 2, 2012. [Invited]
111. I. Noda, "Two-dimensional correlation spectroscopy study of polymers," 19<sup>th</sup> European Symposium on Polymer Spectroscopy (ESPOS19), Prague, Czech Republic, July 9, 2013. [Invited]
112. I. Noda, "Frontiers of 2D correlation," 2DCOS-7, Seoul, Korea, August 22, 2013. [Plenary Lecture]
113. I. Noda, "Vibrational spectroscopy on polymeric materials design and development," ICAVS-7, Kobe, Japan, August 27, 2013. [Invited]

114. I. Noda, "Node attenuation to enhance apparent spectral fine features," SciX 2013, Milwaukee, WI, October 3, 2013.
115. P. Pereira and I. Noda, "Providing leadership in biopolymer technology," 8<sup>th</sup> European Bioplastics Conference, Berlin, Germany, December 11, 2013. [Invited]
116. P. Pereira and I. Noda, "Providing solutions for a healthier planet," 2014 Bioplastics Conference, Las Vegas, NV, March 5, 2014. [Invited]
117. I. Noda, "Evolution of 2D correlation spectroscopy," Two-Dimensional Correlation Spectroscopy Symposium, Kwansai Gakuin University, Sanda, Japan, April 15, 2014. [Invited]
118. I. Noda, "Evolution of 2D correlation spectroscopy," Asian Regional Conference on Two-Dimensional Correlation Spectroscopy (2DCOS-2014), Beijing, China, April 19, 2014. [Invited]
119. P. Pereira, S.B. Lindsey, and I. Noda, "Meridian Holdings Group, Inc.," ANTEC Next Generation Afterglow, Las Vegas, NV, April 28, 2014. [Invited]
120. I. Noda, "Meridian Nodax<sup>TM</sup> PHA copolymers," Biopolymer Symposium, Philadelphia, PA, May 12, 2014. [Invited]
121. I. Noda, "Sequential order determination by two-dimensional correlation and codistribution spectroscopy," SciX 2014, Reno, NV, September 29, 2014. [Invited]
122. I. Noda, "Two-dimensional correlation spectroscopy in materials development," 2014 Eastern Analytical Symposium & Exposition, Somerset, NJ, November 17, 2014. [Invited]
123. P. Pereira and I. Noda, "The new bio economy," 9<sup>th</sup> European Bioplastics Conference, Brussels, Belgium, December 2, 2014,
124. P. Pereira and I. Noda, "The disappearing act — MHG's PHA," InnoPlast Solutions Conference on Bioplastics: Reinvention of Plastics via Renewable Chemicals, Miami, FL, January 29, 2015. [Invited]
125. P. Pereira and I. Noda, "Development and commercialization of *Nodax*<sup>TM</sup> PHA copolymers. A case study," Infocast 6<sup>th</sup> Annual Summit on Next Generation Bio-based & Sustainable Chemicals, New Orleans, LA, February 5, 2015. [Invited]
126. I. Noda, "Two-dimensional correlation spectroscopy study of bioplastics," Pittcon 2015 Conference & Expo, New Orleans, LA, March 10, 2015. [Invited]

## Invited Lectures

1. "Dynamic infrared linear dichroism of polymer films under oscillatory deformation," Polymer Research Center, University of Cincinnati, Cincinnati OH, October 26, 1982.
2. "Dynamic infrared linear dichroism of polymer films under oscillatory deformation," Department of Chemical Engineering, Columbia University in the City of New York, New York NY, November 9, 1982.
3. "Dynamic infrared linear dichroism of polymer films under oscillatory deformation," Department of Chemical Engineering, University of Tennessee, Knoxville TN, November 18, 1982.
4. "Dynamic infrared linear dichroism of polymer films under oscillatory deformation," Department of Chemistry, Virginia Polytechnic Institute and State University, Blacksburg VA, December 10, 1982.
5. "Dynamic infrared linear dichroism of polymer films under oscillatory deformation," Department of Chemical Engineering, Princeton University, Princeton NJ, September 29, 1983.
6. "Dynamic infrared linear dichroism of polymer films under oscillatory deformation," Department of Polymer Science and Engineering, University of Massachusetts, Amherst MA, October 3, 1983.
7. "Dynamic infrared linear dichroism of polymer films under oscillatory deformation," Department of Chemical Engineering, University of Maine at Orono, Orono ME, October 14, 1983.
8. "Dynamic infrared linear dichroism of polymer films under oscillatory deformation," Department of Chemistry, University of Michigan, Ann Arbor MI, September 27, 1984.
9. "Two-dimensional infrared (2D IR) spectroscopy," National Bureau of Standards, Gaithersburg MD, April 23, 1986.
10. "Two-dimensional infrared spectroscopy," Department of Chemical Engineering and Applied Chemistry, Columbia University in the City of New York, New York NY, April 29, 1986.
11. "Development of two-dimensional infrared (2D IR) spectroscopy and its application to polymeric and biological materials," AT&T Bell Laboratories, Murray Hill NJ, April 30, 1986.

12. "Two-dimensional infrared (2D IR) Spectroscopy of Synthetic and Biopolymers," Department of Chemistry, University of Illinois at Urbana- Champaign, Urbana IL, October 27, 1986.
13. "Dynamic infrared linear dichroism spectroscopy and two-dimensional infrared spectroscopy of polymers," Institute of Materials Science, University of Connecticut, Storrs CT, November 14, 1986.
14. "Two-dimensional infrared (2D IR) spectroscopy," Bruker Instruments, Billerica MA, November 13, 1987.
15. "Dynamic infrared linear dichroism (DIRLD) of polymers," Department of Chemistry, University of Wisconsin, Madison WI, January 20, 1988.
16. "Dynamic infrared linear dichroism (DIRLD) of polymers," Chemistry/ Life Science Department, Polytechnic University, New York NY, March 2, 1988.
17. "Dynamic infrared linear dichroism (DIRLD) spectroscopy/two- dimensional infrared spectroscopy of polymers," Department of Polymer Engineering, University of Akron, Akron OH, April 29, 1988.
18. "Two-dimensional infrared (2D IR) spectroscopy," Department of Polymer Chemistry, Kyoto University, Kyoto, Japan, August 8, 1988.
19. "Two-dimensional infrared (2D IR) spectroscopy," The Institute of Physical and Chemical Research, Wako-shi, Japan, August 15, 1988.
20. "Two-dimensional infrared (2D IR) spectroscopy," Department of Applied Physics, the University of Tokyo, Tokyo, Japan, August 16, 1988.
21. "Dynamic infrared linear dichroism and two-dimensional infrared spectroscopy of polymers," Department of Chemical Engineering, Stanford University, Stanford, CA, October 5, 1988.
22. "Dynamic infrared linear dichroism of polymers under oscillatory deformations," Department of Chemical and Nuclear Engineering, University of California, Santa Barbara, CA, October 8, 1988.
23. "Dynamic infrared linear dichroism and two-dimensional infrared spectroscopy of polymers," Department of Chemical Engineering, University of Delaware, Newark DE, October 5, 1989.
24. "Dynamic infrared linear dichroism and two-dimensional infrared spectroscopy of polymers," DuPont Experimental Station, Wilmington DE, October 6, 1989.

25. "Two-dimensional infrared spectroscopy of polymers," Department of Chemical Engineering, University of Cincinnati, Cincinnati OH, April 6, 1990.
26. " Two-dimensional infrared spectroscopy of polymers," Department of Chemistry, University of Chicago, Chicago, IL, April 9, 1990.
27. "Two-dimensional correlation approach to the dynamic rheo-optical characterization of polymers," Dept. of Chemistry, University of Massachusetts, Amherst, September 11, 1990.
28. " Two-dimensional infrared spectroscopy of polymers," Inst. Macromol. Chem., University of Freiburg, Freiburg, Germany, September 19, 1990.
29. " Two-dimensional infrared spectroscopy of polymers," Max-Planck Inst. Polym., Mainz, Germany, September 21, 1990.
30. "Two-dimensional infrared (2D IR) spectroscopy," Nihon Bunko (JASCO), Hachioji, Japan, October 24, 1990.
31. " Two-dimensional infrared (2D IR) spectroscopy," Dept. Chemistry, Univ. of Tokyo, Tokyo, Japan, October 26, 1990.
32. "Dynamic dichroism and two-dimensional infrared spectroscopy," Dept. Chemistry, Laval Univ., Quebec, Canada, December 3, 1990.
33. "Two-dimensional infrared analysis of poly(hydroxyalkanoates)," Dept. Chemistry, McGill Univ., Montreal, Canada, December 4, 1990.
34. "Two-dimensional infrared spectroscopy," Spectroscopy Society of Pittsburgh, Pittsburgh, January 16, 1991.
35. " Two-dimensional infrared spectroscopy," American Chemical Society – Chicago Section, Chicago, January 25, 1991.
36. " Two-dimensional infrared spectroscopy studies of proteins and peptides," Dept. Chemistry, Massachusetts Institute of Technology, Cambridge, February 27, 1991.
37. " Two-dimensional infrared spectroscopy studies of biodegradable polymers," Dept. Chemistry, University of Lowell, Lowell, February 28, 1991.
38. " Two-dimensional infrared spectroscopy studies of block copolymer inter phases," Mitsubishi Petrochemical Co., Yokkaichi, Japan, May 28, 1991.
39. " Two-dimensional infrared spectroscopy studies of biodegradable polymers," Society of Polymer Science, Japan - Hokkaido Section, jointly with Department of Chemistry, Hokkaido University, Sapporo, Japan, June 5, 1991.

40. "Two-dimensional infrared spectroscopy studies of polymers," Society of Textile Science Japan, Tohoku-Hokkaido Section, jointly with Department of Chemistry, Yamagata University, Yonezawa, Japan, June 7, 1991.
41. "Two-dimensional infrared spectroscopy studies of polyolefin blends and alloys," Sumitomo Chemical Co., Sodegaura, Japan, June 10, 1991.
42. "Dynamic infrared linear dichroism and two-dimensional spectroscopy of polymers," California Institute of Technology, Pasadena CA, October 8, 1991.
43. "Dynamic infrared linear dichroism and two-dimensional spectroscopy of polymers," Kodak Research Center, Rochester NY, January 14, 1992.
44. "Two-dimensional infrared spectroscopy," Dept. of Chemistry, Univ. of North Carolina, Chapel Hill NC, January 21, 1992.
45. "Two-dimensional infrared (2D IR) spectroscopy," Du Pont, Experimental Station, Wilmington, DE, February 25, 1992.
46. "Two-dimensional infrared (2D IR) spectroscopy. Theory and Applications," Society for Applied Spectroscopy, Cincinnati Section, March 5, 1992.
47. "Two-dimensional infrared (2D IR) study of biodegradable microbial biopolyesters," Research Laboratories of Resources Utilization, Tokyo Institute of Technology, Nagatsuda, Japan, March 16, 1992.
48. "Dynamics of polymer segmental motions studied by rheo-optical techniques," Department of Chemical Science and Technology, Kyushu University, Fukuoka, Japan, March 17, 1992.
49. "Interphase of microphase separated block copolymers probed by dynamic/2D IR spectroscopy," Department of Synthetic Chemistry, Nagoya University, Nagoya, Japan, March 23, 1992.
50. "Two-dimensional correlation analysis of dynamic rheo-optical data. Infrared and small angle x-ray scattering studies of microphase separated block copolymers," Department of Polymer Chemistry, Kyoto University, Kyoto, Japan, March 25, 1992.
51. "Dynamic/two-dimensional infrared spectroscopy of polymers," Department of Molecular Science, Osaka University, Osaka, Japan, March 26, 1992.
52. "Two-dimensional infrared (2D IR) spectroscopy. A new approach to polymer characterization," Toray Research Center, Ohtsu, Japan, March 27, 1992.

53. "Two-dimensional infrared (2D IR) spectroscopy. Basic concept and description of instrumentation," Institute of Spectroscopy, Russian Academy of Sciences, Troitsk, Russia, Sept. 17, 1992.
54. "Two-dimensional infrared (2D IR) spectroscopy studies of microphase-separated block copolymers," Institute of Chemical Physics, Russian Academy of Sciences, Moscow, Russia, Sept. 17, 1992.
55. "Polymer orientations studied by dynamic rheo-optical techniques," Dept. Polym. Sci. Eng., Kyoto Inst. Technol., Kyoto, Japan, Dec. 7, 1992.
56. "Multi-dimensional correlation approach to vibrational spectroscopy," Faculty of Sciences, Kwansai Gakuin University, Nishinomiya, Japan, Dec. 8, 1992.
57. "Theory, instrumentation, and applications of two-dimensional infrared spectroscopy," Toshiba Research and Development Center, Kawasaki, Japan, Dec. 9, 1992.
58. "Two-dimensional Raman and infrared spectroscopy," Giulio Natta Advanced School of Polymer Science, Polytecnico Milano, Milan, Italy, May 10, 1993.
59. "Two-dimensional infrared spectroscopy," Department of Chemistry, University of Cincinnati, Cincinnati, June 15, 1993.
60. "Dynamic dichroism and 2D IR spectroscopy," Department of Macromolecular Science, Case Western Reserve University, Cleveland OH, Sept. 10, 1993.
61. "Characterization of functional polymers by using two-dimensional spectroscopy," Sophia University, Tokyo, Japan, Sep. 24, 1993.
62. "Two-dimensional infrared analysis of biodegradable polymers," Kobe University, Kobe, Japan, Sep. 27, 1993.
63. "Two-dimensional IR and Raman correlation spectroscopy coupled with electrical field," Tohoku University, Sendai, Japan, Sep. 29, 1993.
64. "2D IR study of reorientation dynamics of nematic liquid crystals," Alps Electric Corp., Sendai, Japan, Sep. 30, 1993.
65. "Two-dimensional correlation method applied to analytical chemistry," Department of Chemistry, the Ohio State University, Columbus OH, Nov. 9, 1993.
66. "Two-dimensional infrared correlation spectroscopy," Department of Chemistry, Princeton University, Princeton NJ, January 5, 1994.
67. "Generalized two-dimensional correlation spectroscopy," Department of Chemistry, University of Rochester, Rochester NY, May 16, 1994.

68. "Dynamic 2D IR spectroscopy studies of polymers," Department of Chemistry, Rensselaer Polytechnic Institute, Troy NY, October 17, 1994.
69. "Dynamic infrared linear dichroism and two-dimensional infrared spectroscopy of polymers," Akron Polymer Lecture Group, Akron OH, December 2, 1994.
70. "Two-dimensional infrared (2D IR) spectroscopy," Department of Chemistry, Kansas State University, Manhattan KS, March 14, 1995.
71. "Generalized two-dimensional infrared (2D IR) spectroscopy," Polaroid Corporation, Cambridge MA, March 22, 1995.
72. "Two-dimensional infrared (2D IR) spectroscopy," Department of Chemistry, Ohio University, Athens OH, March 31, 1995.
73. "Two-dimensional infrared (2D IR) spectroscopy," Department of Chemistry, University of Idaho, Moscow ID, April 6, 1995.
74. "Generalized two-dimensional correlation spectroscopy," Department of Chemistry, University of Cincinnati, Cincinnati OH, October 5, 1995.
75. "Generalized two-dimensional correlation spectroscopy," Department of Chemistry, University of Illinois at Chicago, Chicago IL, October 12, 1995.
76. "Two-dimensional infrared (2D IR) spectroscopy study of polymers," Department of Applied Chemistry, Kansai University, Suita JAPAN, Nov. 8, 1995.
77. "Generalized two-dimensional correlation method for spectroscopic analysis," Inst. for Protein Research, Osaka University, Suita JAPAN, Nov. 9, 1995.
78. "Two-dimensional analysis applied to infrared spectroscopy," Department of Chemistry, University of Louisville, Louisville KY, Dec. 8, 1995.
79. "Two-dimensional infrared correlation spectroscopy," Department of Chemistry, Florida Institute of Technology, Melbourne FL, Jan. 25, 1996.
80. "Two-dimensional IR and NIR spectroscopy," Department of Chemistry, Tufts University, Medford MA, Feb. 27, 1996.
81. "Generalized two-dimensional IR correlation spectroscopy," Department of Chemistry, The State University of New Jersey Rutgers Campus at Newark, Newark NJ, Apr. 11, 1996.
82. "Recent developments in two-dimensional IR spectroscopy," Toray Research Center, Ohtsu, Japan, Sep. 9, 1996.

83. "Applications of two-dimensional IR and NIR spectroscopy," Asahi Chemical Corporation, Moriyama, Japan, Sep. 10, 1996.
85. "Two-dimensional correlation spectroscopy," Catalysis Research Center, Hokkaido University, Sapporo, Japan, Apr. 22, 1997.
86. "Introduction to polymer science. Structure and Optical, Thermal, and Mechanical properties of Polymers," Faculty of Science, Kwansai-Gakuin University, Nishinomiya, Japan, Sep. 26 and 27, 1997.
87. "Two-dimensional infrared correlation spectroscopy," California Institute of Technology, Pasadena CA, Oct. 30, 1997.
88. "Dynamic dichroism and two-dimensional infrared spectroscopy," Department of Materials Science and Engineering, University of Pennsylvania, Philadelphia PA, Nov. 18, 1997.
89. "Two-dimensional infrared correlation spectroscopy," Department of Chemistry and Biochemistry, Miami University, Oxford OH, Dec. 4, 1997.
90. "Two-dimensional spectroscopy: Theory and application," Faculty of Agriculture, Kobe University, Kobe, Japan, May 12, 1998.
91. "Two-dimensional infrared (2D IR) spectroscopy Technique and its applications in the study of biopolymers," Department of Biological Sciences and Biotechnology, Tsinghua University, Beijing, China, Sep. 16, 1998.
92. "Two-dimensional infrared correlation spectroscopy study of polymers," Department of Chemical Engineering, University of California, Santa Barbara CA, Nov. 20, 1998.
93. "Two-dimensional correlation spectroscopy," Department of Chemistry, Concordia University, Montreal, Canada, April 27, 1999.
94. "Two-dimensional infrared correlation study of polymers," Department of Chemical Engineering, Colorado School of Mines, Golden CO, May 11, 1999.
95. "Two-dimensional correlation spectroscopy," Department of Chemistry, Colorado State University, Fort Collins CO, May 12, 1999.
96. "Two-dimensional correlation approach to infrared, Raman, and other areas of spectroscopy," Department of Chemistry, Saga University, Saga, Japan, Mar. 8, 2000.
97. "Two-dimensional infrared (2D IR) spectroscopy," Department of Chemistry, Tulane University, New Orleans, Mar. 20, 2000.

98. "Nodax<sup>TM</sup> – Procter and Gamble's novel polyhydroxyalkanoates," Department of Chemistry, Kwansai-Gakuin University, Sanda, Japan, Nov. 13, 2001.
99. "Two-dimensional correlation spectroscopy," Department of Chemistry, University of Pennsylvania, Philadelphia PA, Dec. 6, 2001.
100. "Nodax<sup>TM</sup>—Procter & Gamble's novel polyhydroxyalkanoates," Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, Feb. 27, 2002.
101. "Two-dimensional correlation spectroscopy," Department of Chemistry, Pohang University of Science and Technology, Pohang, Korea, Feb. 28, 2002.
102. "Synchronicity, linearity and two-dimensional correlation," Department of Chemistry, Kwansai-Gakuin University, Sanda, Japan, May 11, 2002.
103. "Generalized two-dimensional correlation spectroscopy," Department of Food Science, University of Bologna – Cesena, Cesena, Italy, June 3, 2002.
104. "Generalized two-dimensional correlation spectroscopy," Donaghey College of Information Science and Systems Engineering (DCISSE), University of Arkansas at Little Rock, Little Rock, AR, Aug. 30, 2002.
105. "Two-dimensional (2D) correlation spectroscopy," Baltimore-Washington Section, Society for Applied Spectroscopy, Baltimore, MD, Apr. 24, 2003. [SAS Lecture Tour]
106. "Two-dimensional (2D) correlation spectroscopy," Northern California Section, Society for Applied Spectroscopy, San Jose, CA, Apr. 25, 2003. [SAS Lecture Tour]
107. "Short course on 2D correlation spectroscopy," Nottingham, UK, Aug. 24, 2003.
108. "Nodax<sup>TM</sup> – Procter and Gamble's novel polyhydroxyalkanoates," Department of Chemistry, University of Nottingham, Nottingham, UK, Aug. 29, 2003.
109. "Two-dimensional infrared (2D IR) spectroscopy," Department of Chemistry, Youngstown State University, Youngstown OH, Oct. 10, 2003.
110. "Two-dimensional correlation spectroscopy," Department of Chemistry, Hanyang University, Seoul, Korea, June 3, 2004.
111. "Two-dimensional (2D) correlation spectroscopy," College of Chemistry, Jilin University, Changchun, China, Aug. 27, 2004.
112. "Two-dimensional (2D) correlation spectroscopy," Department of Macromolecular Science, Fudan University, Shanghai, China, Aug. 31, 2004.

113. "Nodax PHA copolymers – Biodegradable plastics from renewable resources," Biotechnology Institute, University of Minnesota, Minneapolis MN, Sep. 30, 2004.
114. "Selected topics on Nodax™," Department of Chemistry, School of Science & Technology, and Research Center for Environment Friendly Polymers, Kwansai-Gakuin University, Sanda, Japan, March 25, 2005.
115. "Selected topics on 2D correlation spectroscopy," Department of Chemistry, School of Science & Technology, and Research Center for Environment Friendly Polymers, Kwansai-Gakuin University, Sanda, Japan, March 25, 2005.
116. "Nodax PHA copolymers – Biodegradable plastics from renewable resources," Department of Chemical Engineering and Materials Science, University of Cincinnati, Cincinnati OH, March 31, 2005.
117. "Two-dimensional infrared (2D IR) correlation spectroscopy study of biodegradable polymers," Laboratory of Polymeric Materials and Biomaterials, University of Lyon 1, Lyon, France, April 15, 2005.
118. "Two-dimensional infrared (2D IR) correlation spectroscopy study of biodegradable polymers," Department of Physical Chemistry, University of Duisburg-Essen, Essen, April 18, 2005.
119. "Generalized two-dimensional (2D) correlation spectroscopy study of biomolecules," Department of Chemistry, University of Puerto Rico at Mayagüez, Mayagüez PR, June 3, 2005.
120. "Two-dimensional infrared (2D IR) study of biodegradable Nodax™ copolymers," Konica Minolta Technology Center, Hino, Tokyo, Japan, June 16, 2005.
121. "Short course on 2D correlation spectroscopy," Delavan, WI, Aug. 14, 2005.
122. "Two-dimensional (2D) correlation spectroscopy study of polymers, biomolecules and other interesting systems," Department of Chemical Engineering, Yale University, New Haven CT, September 21, 2005.
123. "Two-dimensional (2D) correlation spectroscopy study of polymers," Department of Chemistry, Nihon University, Tokyo, Japan, March 2, 2006.
124. "Biodegradable plastics from renewable resources," Department of Chemistry, Case Western Reserve University, Cleveland OH, April 26, 2006.
125. "Biodegradable plastics from renewable resources," Department of Polymer Engineering, University of Akron, Akron OH, April 27, 2006.

126. "2D Raman study of emulsion copolymerization reaction," Department of Chemistry, School of Science & Technology, and Research Center for Environment Friendly Polymers, Kwansai-Gakuin University, Sanda, Japan, November 7, 2006.
127. "Dynamic infrared linear dichroism (DIRLD) and two-dimensional infrared (2D IR) correlation spectroscopy," Department of Bioengineering and Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, Urbana, IL, December 15, 2006.
128. "Two-dimensional spectroscopy study of natural and synthetic polymers," Department of Chemistry, Faculty of Science and Engineering, Saga University, Saga, Japan, February 23, 2007.
129. "Two-dimensional spectroscopy study of natural and synthetic polymers," Institute of Chemistry, Chinese Academy of Science, Beijing, China, April 2, 2007.
130. "Short course on 2D correlation spectroscopy," Sanda, Japan, April 21, 2007.
131. "Generalized two-dimensional spectroscopy," College of Chemistry and Molecular Engineering, Peking University, Beijing, China, August 14, 2007.
132. "Bio-based biodegradable polymer Nodax™," College of Chemistry and Molecular Engineering, Peking University, Beijing, China, August 14, 2007.
133. "Short course on 2D correlation spectroscopy," Tsinghua University, Beijing China, August 16, 2007.
134. "Practical applications of 2D correlation spectroscopy," College of Chemistry and Molecular Engineering, Peking University, Beijing, China, October 14, 2008.
135. "Generalized 2D correlation spectroscopy," Department of Chemistry, Tokyo University of Science, Tokyo, Japan, October 22, 2008.
136. "Short course on 2D correlation spectroscopy," National 2DCOS Symposium, Rincón, Puerto Rico, February 20, 2009.
137. "Two-dimensional correlation spectroscopy of polymers," Deutsches Kunststoff-Institut, Darmstadt, Germany, August 3, 2009.
138. "Short course on 2D correlation spectroscopy," The 5<sup>th</sup> International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-5), Wrocław, Poland, August 4, 2009.
139. "Short course on 2D correlation spectroscopy," Eastern Analytical Symposium and Exposition, Somerset, NJ, November 17, 2009.

140. "Bioplastics studied by X-ray, IR and other analytical techniques," Department of Chemical and Bio-Engineering, Hanyang University, Seoul, Korea, February 22, 2010.
141. "Bioplastics studied by 2D correlation spectroscopy," Department of Chemistry, Kangwon National University, Chunchon, Korea, February 23, 2010.
142. "Applications of 2D correlation spectroscopy," Department of Chemistry, Yonsei University, Seoul, Korea, February 24, 2010.
143. "Multiple perturbation 2D correlation spectroscopy," Department of Chemistry, Kwansai Gakuin University, Sanda, Japan, May 27, 2010.
144. "Recent developments in 2D correlation spectroscopy," Department of Chemistry, Tsinghua University, Beijing, China, August 16, 2010.
145. "Bioplastics studied by X-ray, IR and other analytical techniques," Department of Chemistry, Peking University, Beijing, China, August 17, 2010.
146. "Bio-based biodegradable plastics," Department of Chemistry, Jilin University, Changchun, China, August 21, 2010.
147. "Recent developments in 2D correlation spectroscopy," Department of Chemistry, Jilin University, Changchun, China, August 21, 2010.
148. "Short course on 2D correlation spectroscopy," The 5<sup>th</sup> International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS-6), Sonoma County, CA, June 10, 2011.
149. "Two-dimensional (2D) correlation spectroscopy study of polymers, biomolecules and other interesting systems," Department of Chemistry, Waseda University, Tokyo, Japan, March 7, 2012.
150. "Two-dimensional (2D) correlation spectroscopy study of polymers, biomolecules and other interesting systems," Department of Chemistry, Gakushuin University, Tokyo, Japan, March 12, 2012.
151. "Two-dimensional (2D) correlation spectroscopy study of polymers, biomolecules and other interesting systems," Department of Chemistry, University at Albany, SUNY, Albany, NY, April 17, 2012.
152. "Two-dimensional (2D) correlation spectroscopy study of polymers, biomolecules and other interesting systems," Department of Chemistry, Temple University, Philadelphia, PA, April 26, 2012.

153. “Two-dimensional (2D) correlation spectroscopy study of polymers, biomolecules and other interesting systems,” Department of Materials Science & Engineering, University of Delaware, Newark, DE, May 2, 2012.
154. “Bio-based biodegradable plastics from renewable resources,” Delaware Environmental Institute, University of Delaware, Newark, DE, March 19, 2014.
155. “Bio-based biodegradable plastics from renewable resources,” China Agricultural University, Beijing, China, April 21, 2014.
156. “Application of two-dimensional correlation spectroscopy in materials development,” Peking University, Beijing, China, April 21, 2014.
157. “Application of two-dimensional correlation spectroscopy in materials development,” Fuzhou University, Fuzhou, China, April 23, 2014.
158. “Two-dimensional correlation spectroscopy and development of novel bioplastics *Nodax*<sup>TM</sup>,” Department of Chemistry, University of Georgia, Athens, GA, February 11, 2015.

## Isao Noda

### Biography

Isao Noda was born in Tokyo, Japan. He came to the United States in 1969 and was graduated from Columbia University in the City of New York in 1974 with B.S. degree in chemical engineering. He also received his M.S. in bioengineering (1976), as well as M.Phil. (1978) and Ph.D. (1979) in chemical engineering from Columbia. In 1997 he received D.Sc. degree in chemistry from the University of Tokyo. After retiring from the Procter and Gamble Company in 2012, he became an Adjunct Professor at the Department of Materials Science and Engineering, University of Delaware and also holds a position of Senior Vice President of Innovation at Meridian Holdings Group, Inc. in Bainbridge, Georgia. He has recently been appointed to the position of Honorary Guest Professor of the Department of Chemistry at Peking University in China. His research interest is in the broad area of polymer science and spectroscopy. He is known for the development of a novel class of bio-based biodegradable plastics and also a versatile analytical technique called two-dimensional infrared (2D IR) correlation spectroscopy. He is a recipient of the 1991 William F. Meggers Award from the Society for Applied Spectroscopy and the 2002 Williams-Wright Award from the Coblenz Society. He was selected as the 2005 Chemist of the Year by the Cincinnati Section of the American Chemical Society. He received the International Academic Cooperation and Exchange Medal in 2008 from the Chinese Chemical Society and Chinese Optical Society, the New York State Society for Applied Spectroscopy's Gold Medal in 2009, the 2011 Bomem-Mechelson Award from the Coblenz Society, and the 2011 Ellis R. Lippincott Award jointly from the Optical Society of America, the Society for Applied Spectroscopy and the Coblenz Society. He became a Fellow in 2011 and Honorary Member in 2013 of the Society for Applied Spectroscopy and a Fellow of the Optical Society of America in 2012. He has about ninety (90) patents granted in the US and the EU, published over three hundred (300) articles in peer-reviewed journals, and coauthored three (3) books.

### Selected Publications

I. Noda, P.R. Green, M.M. Satkowski, and L.A. Schechtman, "Preparation and properties of a novel class of polyhydroxyalkanoate copolymers," *Biomacromolecules*, **6**(2), 580-586 (2005).

I. Noda and Y. Ozaki, *Two-Dimensional Correlation Spectroscopy — Applications in Vibrational and Optical Spectroscopy*, Wiley: Chichester, UK, 2004.

I. Noda, "A generalized two-dimensional correlation method applicable to infrared, Raman, and other types of spectroscopy," *Appl. Spectrosc.*, **47**(9), 1329-36 (1993).

I. Noda, "Latex Elastomer with a Permanently Hydrophilic Surface," *Nature*, **350**(6314), 143-4 (1991).

I. Noda, "Two-dimensional infrared (2D IR) spectroscopy," *J. Am. Chem. Soc.*, **111**(21), 8116-8, (1989).