

ALEXANDER M. KLIBANOV

Date and Place of Birth: July 15, 1949, in Moscow (Russia)

Nationality: Naturalized U.S. Citizen (1983)

Education:

1974 Ph.D. in Chemical Enzymology, Moscow University
1971 M.S. in Chemistry, Moscow University

Honors:

2015 Tau Beta Pi's Leonardo Da Vinci Lecturer, MIT
2007-11 and 2014-2012-13 Novartis Chair Endowed Professorship, MIT
2012-13 Roger and Georges Firmenich Endowed Professorship, MIT
2011 MIT Biological Engineering Senior Class Faculty Award
2006 Distinguished GRUM Lecturer in Drug Discovery & Development,
University of Montreal (Canada)
2004 UNAM Distinguished Lecturer, National University of Mexico (Mexico
City)
2001 Walter Enz Lecturer in Pharmaceutical Chemistry, University of Kansas
2001 Elected a Corresponding Fellow of the Royal Society of Edinburgh
(Scotland's National Academy of Science and Letters)
2000 Merck Distinguished Lecturer, Rutgers University
2000 Top 20 *Biotechnology & Bioengineering* Papers of the Last Forty Years
1998 Robert Lutz Lecturer, University of Virginia
1996 Perkin-Elmer Distinguished Lecturer, University of Pittsburgh
1995 Elected to the National Academy of Sciences of the U.S.A.
1995 Nathan O. Kaplan Memorial Lecturer in Biological Chemistry, University
of California at San Diego
1994 R.W. Johnson PRI Lecturer, Pharmaceutical Research Institute
1994 Warren McCabe Lecturer, North Carolina State University
1993 Elected to the National Academy of Engineering of the U.S.A.
1993 Arthur C. Cope Scholar Award of the American Chemical Society
1993 Biotechnology Divisional Lectureship Award of the Institute of Food
Technologists
1992 Charles Sabat Lecturer, Rutgers University
1992 Elected a Founding Fellow of the American Institute for Medical and
Biological Engineering
1992 Louis C. Jordy Research Scholar Lecturer, Drew University
1991 International Enzyme Engineering Award
1991 Marvin J. Johnson Award of the American Chemical Society
1990 Monsanto Lecturer, Ohio State University
1990 NRC Distinguished Lecturer, Academia Sinica (Taiwan)
1989 Ipatieff Prize of the American Chemical Society
1989 Backer Lecturer, Groningen University (Holland)
1988 Dow Lecturer, University of Ottawa (Canada)
1987 Distinguished Scholar Lecturer, Hope College
1986 Leo Friend Award of the American Chemical Society

1984 Who's Who in Frontier Science and Technology
1984 Sohio Lecturer, Case Western Reserve University
1982 American Men and Women of Science
1981-1983 Henry L. Doherty Career Development Professorship, MIT
1975 U.S.S.R. Ministry of Higher Education Prize

Professional Experience:

2007-11 and 2014- Novartis Chair Endowed Professor of Chemistry and Bioengineering, MIT
2012-2013 Roger and Georges Firmenich Professor of Natural Products Chemistry
Department of Chemistry, MIT
2000-present Professor of Bioengineering
Department of Biological Engineering, MIT
1988-present Professor of Chemistry
Department of Chemistry, MIT
1987-1988 Professor of Applied Biochemistry
Department of Applied Biological Sciences, MIT
1983-1987 Associate Professor of Applied Biochemistry
Department of Applied Biological Sciences (formerly
Department of Nutrition and Food Science), MIT
1979-1983 Assistant Professor of Applied Biochemistry
Department of Nutrition and Food Science, MIT
1977-1979 Postdoctoral Associate, Department of Chemistry
University of California at San Diego
1974-1977 Research Chemist
Department of Chemistry, Moscow University

Current Journal Editorial/Advisory Boards:

"Biocatalysis and Biotransformation", "Applied Biochemistry and Biotechnology", "Open Chemistry Journal", "Biotechnology Progress", "Biotechnology & Bioengineering", "Microbial Biotechnology", "Open Journal of Pharmacology", "Nanocarriers", "Journal of Antivirals and Antiretrovirals", "Open Access Academic Books in Chemistry", "Journal of Biological Chemistry and Molecular Pharmacology", "Archives of Natural Products and Medicinal Chemistry", "Recent Patents in Biotechnology", "Current Pharmaceutical Biotechnology", and "Archives of Medical Biotechnology", "International Journal of Drug Design, Delivery and Safety"

Professional Societies:

U.S. National Academy of Sciences, U.S. National Academy of Engineering, American Chemical Society, American Institute for Medical and Biological Engineering

Current Research Interests:

Enzyme chemistry and biotechnology Medicinal and formulation chemistry
Protein drug delivery Antimicrobial polymers
Enzymes as stereoselective catalysts in organic syntheses

Publications:

1. Varfolomeyev, S.D., Klibanov, A.M., Berezin, I.V. 1971. Light-initiated enzymic activity caused by photostereoisomerization of *cis*-4-nitrocinnamoyl- α -chymotrypsin. FEBS Lett. **15**: 118 -120.
2. Varfolomeyev, S.D., Klibanov, A.M., Martinek, K., Berezin, I.V. 1972. Light-sensitive catalysts. 4-Nitrocinnamoyl residue as a chromophoric reporter group in the α -chymotrypsin active center. Dokl. Acad. Nauk SSSR **203**: 616-619.
3. Klibanov, A.M., Samokhin, G.P., Martinek, K., Berezin, I.V. 1974. Mechanochemistry of catalytic systems. Regulation by a mechanical action of the enzymatic properties of α -chymotrypsin covalently attached to a nylon fiber. Dokl. Acad. Nauk SSSR **218**: 715-718.
4. Berezin, I.V., Varfolomeyev, S.D., Klibanov, A.M., Martinek, K. 1974. Light and ultrasonic regulation of α -chymotrypsin catalytic activity. Proflavin as a light- and sound- sensitive competitive inhibitor. FEBS Lett. **39**: 329-331.
5. Berezin, I.V., Klibanov, A.M., Martinek, K. 1974. The mechanochemistry of immobilized enzymes. How to steer a chemical process at the molecular level by a mechanical device. Biochim. Biophys. Acta **364**: 193-199.
6. Berezin, I.V., Klibanov, A.M., Goldmacher, V.S., Martinek, K. 1974. Mechanochemistry of catalytic systems. Regulation by a mechanical action of the enzymatic activity of trypsin entrapped in polyacrylamide gel. Dokl. Acad. Nauk SSSR **218**: 367-370.
7. Klibanov, A.M., Martinek, K., Berezin, I.V. 1974. The effect of ultrasound on α -chymotrypsin. A novel approach to studying conformational transitions in active centers of enzymes. Biochemistry SSSR **39**: 878-887.
8. Berezin, I.V., Klibanov, A.M., Klyosov, A.A., Martinek, K., Svedas, V.K. 1975. The effect of ultrasound as a new method of studying conformational transitions in enzyme active centers. pH- and temperature-induced conformational transitions in the active center of penicillin amidase. FEBS Lett. **49**: 325-328.
9. Berezin, I.V., Klibanov, A.M., Martinek, K. 1975. Kinetic and thermodynamic aspects of catalysis by immobilized enzymes. Russ. Chem. Revs. **44**: 17-47.
10. Martinek, K., Goldmacher, V.S., Klibanov, A.M., Berezin, I.V. 1975. Denaturing agents (urea, acrylamide) protect enzymes against irreversible thermoinactivation: a study with native and immobilized α -chymotrypsin and trypsin. FEBS Lett. **51**: 152-155.
11. Martinek, K., Klibanov, A.M., Tchernysheva, A.V., Berezin, I.V. 1975. The stabilization of α -chymotrypsin by entrapment in polymethacrylate gels. Dokl. Acad. Nauk SSSR **223**: 233-236.
12. Tchernysheva, A.V., Goldmacher, V.S., Klibanov, A.M., Martinek, K., Berezin, I.V. 1975. The catalytic activity and thermostability of α -chymotrypsin oligomers entrapped in cross-linked polymeric gels. Bull. Moscow Univ. **19**: 428-431.

13. Tchernysheva, A.V., Martinek, K., Klibanov, A.M., Mevkh, A.T., Berezin, I.V. 1975. The catalytic properties and thermostability of α -chymotrypsin in different polymethacrylate gels. Izvestia Acad. Nauk SSSR, Ser. Khim. No.8: 1764-1768.
14. Klibanov, A.M., Samokhin, G.P., Martinek, K., Berezin, I.V. 1976. Enzymatic mechanochemistry: a new approach to studying the mechanism of enzyme action. Biochim. Biophys. Acta 438: 1-12.
15. Berezin, I.V., Klibanov, A.M., Samokhin, G.P., Martinek, K. 1976. Mechanochemistry of immobilized enzymes: a new approach to studies in fundamental enzymology. Regulation by a mechanical device of the catalytic properties of enzymes covalently attached to elastic polymeric supports. Meth. Enzymol. 44: 558-571.
16. Berezin, I.V., Klibanov, A.M., Goldmacher, V.S., Martinek, K. 1976. Mechanochemistry of immobilized enzymes: a new approach to studies in fundamental enzymology. Regulation by a mechanical device of the catalytic activity of enzymes trapped in polyacrylamide gel. Meth. Enzymol. 44: 571-576.
17. Klibanov, A.M., Kazanskaya, N.F., Larionova, N.I., Martinek, K., Berezin, I.V. 1976. A comparative study of the dynamic structures of the active centers of proteolytic enzymes by the ultrasonic method. The effect of ultrasound on α -trypsin, β -trypsin, and trypsinogen. J. Bioorg. Chem. (Russ.) 2: 828-836.
18. Martinek, K., Goldmacher, V.S., Klibanov, A.M., Torchilin, V.P., Smirnov, V.N., Chazov, E.I., Berezin, I.V. 1976. Thermal stabilization of α -chymotrypsin by covalent attachment to a complementary surface of a polymeric matrix. Dokl. Acad. Nauk SSSR 228: 1468-1471.
19. Poglazov, B.F., Samokhin, G.P., Klibanov, A.M., Levitsky, D.I., Martinek, K., Berezin, I.V. 1977. Mechanochemistry of the myosin molecule. Dokl. Acad. Nauk SSSR 234: 482-485.
20. Berezin, I.V., Klibanov, A.M., Samokhin, G.P., Goldmacher, V.S., Martinek, K. 1977. Mechanosensitive and sound-sensitive systems as chemical amplifiers of weak signals. In: *Biomedical Applications of Immobilized Enzymes and Proteins* (T.M.S. Chang, ed.), vol. 2, pp. 237-251, Plenum Press, New York.
21. Klibanov, A.M., Samokhin, G.P., Martinek, K., Berezin, I.V. 1977. A new mechanochemical method of enzyme immobilization. Biotechnol. Bioeng. 19: 211-218.
22. Martinek, K., Klibanov, A.M., Samokhin, G.P., Semenov, A.M., Berezin, I.V. 1977. Preparative enzymatic synthesis in biphasic water-organic systems. J. Bioorg. Chem. (Russ.) 3: 696-702.
23. Klibanov, A.M., Samokhin, G.P., Martinek, K., Berezin, I.V. 1977. A new approach to preparative enzymatic synthesis. Biotechnol. Bioeng. 19: 1351-1361.
24. Martinek, K., Klibanov, A.M., Goldmacher, V.S., Berezin, I.V. 1977. The principles of enzyme stabilization. I. Increase in thermostability of enzymes covalently bound to a complementary surface of a polymeric support in a multipoint fashion. Biochim. Biophys. Acta 485: 1-12.

25. Martinek, K., Klibanov, A.M., Goldmacher, V.S., Tchernysheva, A.V., Mozhaev, V.V., Berezin, I.V., Glotov, B.O. 1977. The principles of enzyme stabilization. II. Increase in thermostability of enzymes as a result of multipoint non-covalent interactions with a polymeric support. Biochim. Biophys. Acta **485**: 13-28.
26. Torchilin, V.P., Maksimenko, A.V., Smirnov, V.N., Martinek, K., Klibanov, A.M., Berezin, I.V. 1978. The principles of enzymes stabilization. III. The effect of the length of intramolecular cross-linking agents on the thermostability of enzymes. Biochim. Biophys. Acta **522**: 277-283.
27. Samokhin, G.P., Klibanov, A.M., Martinek, K. 1978. Photochemical immobilization of enzymes. Bull. Moscow Univ. **19**: 433-436.
28. Poglazov, B.F., Samokhin, G.P., Klibanov, A.M., Levitsky, D.I., Martinek, K., Berezin, I.V. 1978. The effect of mechanical stretching of myosin rod part (fragment LMM + HMM S-2) on the ATPase activity of myosin. Biochim. Biophys. Acta **524**: 245-253.
29. Klibanov, A.M., Semenov, A.N., Samokhin, G.P., Martinek, K. 1978. Enzymatic reactions in water-organic solutions. The criterion for selecting optimal organic co-solvents. J. Bioorg. Chem. (Russ.) **4**: 236-242.
30. Sinitsyn, A.P., Klibanov, A.M., Klesov, A.A., Martinek, K. 1978. The dependence of stability of immobilized glycoamylase on the method of immobilization. Appl. Biochem. Microbiol. (Russ.) **14**: 236-242.
31. Klibanov, A.M., Mozhaev, V.V. 1978. On the mechanism of irreversible thermoinactivation of enzymes and possibilities for reactivation of "irreversibly" inactivated enzymes. Biochem. Biophys. Res. Commun. **83**: 1012-1017.
32. Klibanov, A.M., Kaplan, N.O., Kamen, M.D. 1978. A rationale for stabilization of oxygen-labile enzymes: application to a clostridial hydrogenase. Proc. Natl. Acad. Sci. USA **75**: 3640-3643.
33. Torchilin, V.P., Maksimenko, A.V., Smirnov, V.N., Berezin, I.V., Klibanov, A.M., Martinek, K. 1979. The principles of enzyme stabilization. IV. Modification of "key" functional groups in the tertiary structure of proteins. Biochim. Biophys. Acta **567**: 1-11.
34. Klibanov, A.M., Kaplan, N.O., Kamen, M.D. 1979. Chelating agents protect hydrogenase against oxygen inactivation. Biochim. Biophys. Acta **547**: 411-416.
35. Klibanov, A.M. 1979. Stabilization of enzymes by immobilization. Anal. Biochem. **93**: 1-25.
36. Klibanov, A.M., Kaplan, N.O., Kamen, M.D. 1980. Thermal stabilities of membrane-bound, solubilized and artificially immobilized hydrogenase from *Chromatium vinosum*. Arch. Biochem. Biophys. **199**: 545-549.
37. Klibanov, A.M., Puglisi, A.V. 1980. The regeneration of coenzymes using immobilized hydrogenase. Biotechnol. Lett. **2**: 445-450.
38. Klibanov, A.M., Kaplan, N.O., Kamen, M.D. 1980. Approaches to stabilization of hydrogenase and nitrogenase against oxygen inactivation. In: Enzyme Engineering V (H.H. Weetall and G.P. Royer, eds.), pp.135-142, Plenum Press, New York.

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