

JAYANT M. MODAK

PERSONAL INFORMATION

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Office: Department Of Chemical Engineering
Indian Institute Of Science
Bangalore 560012, India

Residence: 1171, BEL Layout IInd Block
1st Main, 1st Cross, Vidyananyapura
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Date of Birth: May 30, 1962

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EDUCATION

1983	BS in Chemical Engineering	University of Bombay, India
1985	MS in Chemical Engineering	Purdue University, USA
1988	PhD in Chemical Engineering	Purdue University, USA

PROFESSIONAL EXPERIENCE

Indian Institute of Science, Bangalore, India

Deputy Director	2015 - 2020
Chief Executive, Society for Innovation & Development	2012 - 2015
Chairman, Intellectual Property Cell	2012 - 2015
Chairman, Advanced Bioresidue Energy Technology Society	2012 - 2017
Chairman, Center for Sponsored Schemes & Projects	2010 - 2012
Associate Faculty, Center for Sustainable Technology	2010 - Present
Chairman, Department of Chemical Engineering	2002 - 2008
Professor, Department of Chemical Engineering	2001 - Present
Associate Professor, Department of Chemical Engineering	1995 - 2001
Assistant Professor, Department of Chemical Engineering	1989 - 1995

Purdue University, USA

Visiting Professor, Forney School of Chemical Engineering	2008 - 2009
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Gesellschaft für Biotechnologische Forschung (GBF), Germany

Visiting Scientist	1999 - 2000
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University of California, Irvine, USA

Postdoctoral Research Assistant	1988 - 1989
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AWARDS AND HONORS

- 2019 Listed in Top 2% Scientists in the world in the field of Chemical Engineering for career-long citation impact up until the end of 2019, A Study conducted by Stanford University (PLoS Biol 18(10): e3000918.)
- 2019 UDCT Alumni Association Distinguished Alumni Award
- 2013 Fellow, The National Academy of Science
- 2013-14 The Dow Professor M. M. Sharma Distinguished Visiting Professorship in Chemical Engineering, Institute of Chemical Technology
- 2011-12 Dr. Balawant S. Joshi Distinguished Visiting Professorship, Institute of Chemical Technology, Mumbai
- 2004 Sir C.V. Raman Young Scientist Award, Government of Karnataka
- 2005 Fellow, Indian National Academy of Engineering.
- 2003 Biotech Process Development and Commercialization of Technology, Department of Biotechnology, Govt. of India
- 2002-03 Professor G. M. Abhyankar Memorial Fellow in Chemical Engineering, University Institute of Chemical Technology, Mumbai
- 1999-2000 Alexander von Humboldt Research Fellowship, Alexander von Humboldt Foundation, Germany
- 1996 Amar Dye Chem award for Excellence in Research, Indian Institute of Chemical Engineers
- 1983 P. C. Ray Award, Indian Institute of Chemical Engineers
- 1983 Dr. G. P. Kane Gold Medal, University of Bombay, India

PROFESSIONAL ACTIVITIES

Department of Science and Technology, Government of India

Member, Fast Track Scheme for Young Scientist	2004 - 2015
Member, Chemical Engineering Project Advisory Committee	2007 - 2018
Member, Food Processing Project Advisory Committee	2012 - 2017
Member, TIFAC committee of Bioprocesses	2012 - 2016
Member, Patent Valuation Committee, DSIR	2013 - 2017
Chairman, Early Career Research Award, SERB	2015 - 2018
Member, Nano Applications and Technology Group, Nano Mission	2015 - 2017

Department of Biotechnology, Government of India

Member, Biotech Product and Process Development Task Force	2008 - 2017
Member, Task Force on Systems and Synthetic Biology	2012 - 2018

Member, Scientific and Technical Appraisal and Advisory Group (STAG) on Bioenergy Center	2013 - Present
Member, Scientific Advisory Committee, IOC-DBT Bioenergy Centre	2013 - Present
Member, Governing Council, IOC-DBT Bioenergy Centre	2015 - Present
Member, Scientific Advisor Committee, Pan IIT Bioenergy Centre	2018 - Present
Member, Expert Committee on NER Twinning R&D Program	2018 - Present
Chair - Technical Experts Committee on Energy Biosciences	2018 - Present
Member - Scientific and Technical Appraisal and Advisory Group (STAG) on Energy, Environment and Bioresources Based Applications	2018 - Present
Member - NER Scientific and Technical Appraisal and Advisory Group (STAG) on Energy, Environment and Bioresources Based Applications	2018 - Present
Chair - Project Monitoring Committee of Bioenergy Centers	2019 - Present

Others

Member, Editorial Board, Indian Chemical Engineer	2006 - Present
Member, Scientific Advisory Committee, Richcore Lifesciences	2009 - Present
Council Member, Indian Institute of Chemical Engineers	2008 - 2010
Member, Research Advisory Board, NIT - Karnataka	2010 - 2012
Visitor's Nominee, Faculty Selection Committee, IIT - Guwahati	2010 - 2013
Member, Academic Council, MS Ramaiah Institute of Technology	2011 - 2014
Member, Review Committee of Indo US program on Bioenergy	2012 - 2018
Independent Director, Mangalore Refinery & Petrochemicals Ltd.	2013 - 2014
Member, Industrial Research Committee, CEFIPRA	2015 - 2019
Council Member, CII Karnataka State	2015 - 2017
Member, Consultation Group on SETU Initiative, Niti Aayog, GOI	2015
Member, Consultation committee for NIFETM. Ministry of Food Processing	2015
Member, US-India Joint Committee for Healthy Individuals	2016 - Present
Chair, Promotion and Assessment Committee, DRDO	2017 - Present
Member, Expert Committee for R&D Projects, MoFPI	2017 - Present
Council Member, National Academy of Sciences	2017 - 2019
Member, Initial Sectional Committee, National Board of Accreditation	2017 - 2019
Member, Editorial Board, Industrial & Engineering Chemistry	2020 - present

RESEARCH

Research Interests

Modeling, Optimization and Control of Chemical and Biochemical Processes
 CFD modeling of Chemical & Biochemical Reactors
 Bioreactors for algal cultivations
 Wastewater treatment

Sponsored Research Projects:

Completed: 13 In progress:

1. Biobeneficiation of Bauxite for Refractory Applications, Department of Science and Technology, GOI.
2. Bioleaching Under Applied Potential, Department of Science and Technology GOI.
3. Design of demonstration bioreactor for refractory gold ores, Department of Biotechnology, GOI.
4. Design improvements & modeling of solid phase stratified bed (SSB) biogas plants for biomass, MNES, GOI.
5. Bioreactors for clean coffee effluents, Indo-Norwegian Environment Program.
6. Environmental Screening of Public sector undertakings, Govt. of Karnataka
7. Biobeneficiation of sea nodules, Department of Science and Technology GOI.
8. Enzymatic reactions in supercritical carbondioxide, Department of Biotechnology, GOI.
9. Engineering analysis of *Pichia pastoris* fermentation, Department of Science and Technology GOI.
10. Optimal control of fed-batch fermentation process, MHRD
11. Novel nanostructured polyelectrolyte multilayer films, Department of Science and Technology GOI.
12. Photocatalytic degradation of microorganisms, Department of Science and Technology GOI.
13. Computational Fluid Dynamic (CFD) Modeling of Algal Photobioreactors for CO₂ Sequestration and Conversion to Value Added Products (food, fuel), Department of Biotechnology, GOI.

Industrial Consultancy Projects:

Completed: 10 Ongoing:

1. Biological and Chemical Processing of Ores and Tailings From Hutti Gold Mines, Hutti Gold Mines Ltd.
2. Calcium and Iron Removal from Bauxite Ores, Orient Abrasive Ltd.
3. Continuous bioleaching of refractory gold ores, Hutti Gold Mines, Hutti Gold Mines Ltd.
4. Modeling of Rifamycin fermentation, ABB.
5. Bioleaching of nickel ores, TISCO.
6. Hydroxylation of benzofuran, FMC.
7. Hydrodynamic characterization of Biostat cultibag STR 200L, Sartorius
8. Photocatalytic degradation of microorganisms, Panasonic
9. Photocatalytic reduction of Cr(VI), Panasonic
10. Long term stability of TiO₂ catalyst, Panasonic Ltd.

PUBLICATIONS:

International Refereed Journals:	131
Total number of citations*:	3174

Conference Proceedings:	32
Patents:	6
h index*:	33

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(* source: Scopus, accessed on 13/12/2020)

Debasis Sarkar and Jayant M. Modak, Optimization of fed-batch bioreactors using genetic algorithms, *Chemical Engineering Science*, **58**, 2283-2296, 2003. Listed as highly cited paper in 2003-06 period by Elsevier

Konde, K. S.; Modak, J. M., Optimization of Bioreactor Using Metabolic Control Analysis Approach , *Biotechnol. Prog.*; (Article); **2007**; 23(2); 370-380., Listed as most accessed article, Apr-June 2007, by ACS

Refereed Journals

1. Zhao, Xin, Boruah, Bhanupriya, Chin, Kek Foo, \u272Doki\u263c, Milos, Modak, Jayant M. and Soo, Han Sen. Upcycling to Sustainably Reuse Plastics. *Advanced Materials*, 202100843 (2021).
2. Ru Ng, A. Y., Boruah, B., Chin, K. F., Modak, J. M. & Soo, H. S. Photoelectrochemical Cells for Artificial Photosynthesis: Alternatives to Water Oxidation. *ChemNanoMat* **6**, 185–203 (2020).
3. Anil, C., Modak, J. M. & Madras, G. Syngas production via CO₂ reforming of methane over noble metal (Ru, Pt, and Pd) doped LaAlO₃ perovskite catalyst. *Molecular Catalysis* **484**, 110805 (2020).
4. Gupta, R. & Modak, J. Bacterial Lysis via Photocatalysis - A Critical Mechanistic Review. *ChemCatChem* vol. 12 2148–2170 (2020).
5. Boruah, B., Samantaray, P. K., Madras, G., Modak, J. M. & Bose, S. Sustainable photocatalytic water remediation via dual active strongly coupled AgBiO₃ on PVDF/PBSA membranes. *Chemical Engineering Journal* **394**, 124777 (2020).
6. Boruah, B., Gupta, R., Modak, J. M. & Madras, G. Enhanced photocatalysis and bacterial inhibition in Nb₂O₅: Via versatile doping with metals (Sr, Y, Zr, and Ag): A critical assessment. *Nanoscale Advances* **1**, 2748–2760 (2019).
7. Gupta, R., Modak, J. M. & Madras, G. Behavioral analysis of simultaneous photo-electro-catalytic degradation of antibiotic resistant: E. coli and antibiotic via ZnO/CuI: A kinetic and mechanistic study. *Nanoscale Advances* **1**, 3992–4008 (2019).
8. Gupta, R., Boruah, B., Modak, J. M. & Madras, G. Kinetic study of Z-scheme C₃N₄/CuWO₄ photocatalyst towards solar light inactivation of mixed populated bacteria. *Journal of Photochemistry and Photobiology A: Chemistry* **372**, 108–121 (2019)..
9. Boruah, B., Gupta, R., Modak, J. M. & Madras, G. Novel insights into the properties of AgBiO₃ photocatalyst and its application in immobilized state for 4-nitrophenol degradation and bacteria inactivation. *Journal of Photochemistry and Photobiology A: Chemistry* **373**, 105–115 (2019).
10. Lamba, N., Gupta, R., Modak, J. M. & Madras, G. ZnO catalyzed transesterification of Madhuca indica oil in supercritical methanol. *Fuel* **242**, 323–333 (2019).

11. Gupta, R., Eswar, N. K. R., Modak, J. M. & Madras, G. Ag and CuO impregnated on Fe doped ZnO for bacterial inactivation under visible light. *Catalysis Today* **300**, 71–80 (2018).
12. Lamba, N., Adhikari, S., Modak, J. M. & Madras, G. Catalytic synthesis of fatty acid methyl esters from Madhuca indica oil in supercritical methanol. *Energy Conversion and Management* **173**, 412–425 (2018).
13. Sarat Chandra, T., Aditi, S., Maneesh Kumar, M., Mukherji, S., Modak, J., Chauhan, V. S., Sarada, R., & Mudliar, S. N. Growth and biochemical characteristics of an indigenous freshwater microalga, *Scenedesmus obtusus*, cultivated in an airlift photobioreactor: effect of reactor hydrodynamics, light intensity, and photoperiod. *Bioprocess and Biosystems Engineering*, **40**, 1057–1068 (2017).
14. Gupta, R., Eswar, N. K. R., Modak, J. M. & Madras, G. Effect of morphology of zinc oxide in ZnO-CdS-Ag ternary nanocomposite towards photocatalytic inactivation of *E. coli* under UV and visible light. *Chemical Engineering Journal* **307**, 966–980 (2017)
15. Lamba, N., Gupta, K., Modak, J. M. & Madras, G. Biodiesel synthesis from *Calophyllum inophyllum* oil with different supercritical fluids. *Bioresource Technology* **241**, 767–774 (2017).
16. Lamba, N., Modak, J. M. & Madras, G. Fatty acid methyl esters synthesis from non-edible vegetable oils using supercritical methanol and methyl tert-butyl ether. *Energy Conversion and Management* **138**, 77–83 (2017).
17. Lamba, N., Narayan, R. C., Raval, J., Modak, J. & Madras, G. Experimental solubilities of two lipid derivatives in supercritical carbon dioxide and new correlations based on activity coefficient models. *RSC Advances* **6**, 17772–17781 (2016).
18. Lamba, N., Narayan, R. C., Modak, J. & Madras, G. Solubilities of 10-undecenoic acid and geraniol in supercritical carbon dioxide. *Journal of Supercritical Fluids* **107**, 384–391 (2016).
19. Gupta, R., Krishnarao Eswar, N., Modak, J. M. & Madras, G. Visible light driven efficient N and Cu co-doped ZnO for photoinactivation of: *Escherichia coli*. *RSC Advances* **6**, 85675–85687 (2016).
20. Mandli, A. R. & Modak, J. M. Cybernetic Modeling Revisited: A Method for Inferring the Cybernetic Variables from Experimental Data. *Industrial and Engineering Chemistry Research* **54**, 10190–10196 (2015).
21. Mandli, A. R., Venkatesh, K. V. & Modak, J. M. Constraints based analysis of extended cybernetic models. *BioSystems* **137**, 45–54 (2015).
22. Manoharan, S., Modak, J. & Dighe, R. Engineering the N-glycosylation pathway in *Pichia pastoris* for the expression of glycoprotein hormones. in *Food, Pharmaceutical and Bioengineering Division 2015 - Core Programming Area at the 2015 AIChE Meeting* vol. 2 713–714 (2015).
23. Mandli, A. R. & Modak, J. M. Optimal control analysis of the dynamic growth behavior of microorganisms. *Mathematical Biosciences* **258**, 57–67 (2014).
24. Mandli, A. R. & Modak, J. M. Cybernetic modeling of adaptive prediction of environmental changes by microorganisms. *Mathematical Biosciences* **248**, 40–45 (2014).
25. Mandli, A. R. & Modak, J. M. Evolutionary algorithm for the determination of optimal mode of bioreactor operation. *Industrial and Engineering Chemistry Research* **51**, 1796–1808 (2012).
26. Sontakke, S., Mohan, C., Modak, J. & Madras, G. Visible light photocatalytic inactivation of *Escherichia coli* with combustion synthesized TiO₂. *Chemical Engineering Journal* **189–190**, 101–107 (2012).
27. Sontakke, S., Modak, J. & Madras, G. Photocatalytic inactivation of *Escherichia coli* with LbL fabricated immobilized TiO₂ thin films. *Journal of Advanced Oxidation Technologies* **14**, 86–92 (2011).

28. Sontakke, S., Modak, J. & Madras, G. Effect of inorganic ions, H₂O₂ and pH on the photocatalytic inactivation of Escherichia coli with silver impregnated combustion synthesized TiO₂ catalyst. *Applied Catalysis B: Environmental* **106**, 453–459 (2011).
29. Priya, D. N., Modak, J. M., Trebše, P., Žabar, R. & Raichur, A. M. Photocatalytic degradation of dimethoate using LbL fabricated TiO₂/polymer hybrid films. *Journal of Hazardous Materials* **195**, 214–222 (2011).
30. Modak, J. M. Haber process for ammonia synthesis. *Resonance* **16**, 1159–1167 (2011).
31. Modak, J. M. Systems biology. *Indian Chemical Engineer* vol. 52 (2010).
32. Chanda, M., Pillay, S. A., Sarkar, A. & Modak, J. M. Interpenetrating networks of cross-linked poly(acrylic acid) and cross-linked polyethyleneimine (80% Ethoxylated) for desalination of brackish water by thermoreversible sorption. *Industrial and Engineering Chemistry Research* **49**, 7136–7146 (2010).
33. Sontakke, S., Modak, J. & Madras, G. Photocatalytic inactivation of Escherichia coli and Pichia pastoris with combustion synthesized titanium dioxide. *Chemical Engineering Journal* **165**, 225–233 (2010).
34. Modak, J., Konde, K. Multiobjective optimization of Pichia pastoris fermentations, *New Biotechnology* **25**, S241–S241 (2009).
35. Chanakya, H. N., Reddy, B. V. V. & Modak, J. Biomethanation of herbaceous biomass residues using 3-zone plug flow like digesters - A case study from India. *Renewable Energy* **34**, 416–420 (2009).
36. Chandraprabha, M. N., Modak, J. M. & Natarajan, K. A. Soft-particle model analysis of effect of LPS on electrophoretic softness of Acidithiobacillus ferrooxidans grown in presence of different metal ions. *Colloids and Surfaces B: Biointerfaces* **69**, 1–7 (2009).
37. Chanda, M., Pillay, S. A., Sarkar, A. & Modak, J. M. A thermally regeerable composite sorbent of crosslinked poly(acrylic acid) and ethoxylated polyethyleneimine for water desalination by sirotherm process. *Journal of Applied Polymer Science* **111**, 2741–2750 (2009).
38. Jaisankar, S. & Modak, J. M. Ferrous iron oxidation by foam immobilized acidithiobacillus ferrooxidans: Experiments and modeling. *Biotechnology Progress* **25**, 1328–1342 (2009).
39. Priya, D. N., Modak, J. M. & Raichur, A. M. LbL fabricated poly(Styrene Sulfonate)/TiO₂ multilayer thin films for environmental applications. *ACS Applied Materials and Interfaces* **1**, 2684–2693 (2009).
40. Modak, J. M. & Madras, G. Scientometric analysis of chemical engineering publications. *Current Science* **94**, 1265–1272 (2008).
41. Sarkar, Debasis; Modak, J. M. Dynamic Reoptimisation of Fed-batch Bioreactors Using Genetic Algorithms. *Indian Chemical Engineer* **49**, 375–391 (2007).
42. Chandraprabha, M. N., Modak, J. M. & Natarajan, K. A. Effect of LPS removal on electrophoretic softness of Acidithiobacillus ferrooxidans cells. in *Advanced Materials Research* vols 20–21 341–344 (2007).
43. Karmarkar, A., Chauhan, S. S., Modak, J. M. & Chanda, M. Mechanical properties of wood-fiber reinforced polypropylene composites: Effect of a novel compatibilizer with isocyanate functional group. *Composites Part A: Applied Science and Manufacturing* **38**, 227–233 (2007).
44. Konde, K. S. & Modak, J. M. Optimization of bioreactor using metabolic control analysis approach. *Biotechnology Progress* **23**, 370–380 (2007).
45. Sarkar, D. & Modak, J. M. Optimal design of multiproduct batch chemical plant using NSGA-II. *Asia-Pacific Journal of Chemical Engineering* **1**, 13–20 (2006).

46. Modak, J. M. *Bioprocessing of Refractory Gold Ores. Annals of Indian Academy of Engineering* **III**, 97–106 (2006).
47. Chanda, M., Pillay, S. A., Sarkar, A. & Modak, J. M. A novel fiber-coated strong base-type anion exchanger with superfast kinetics. Removal and recovery of silver thiosulfate from aqueous solutions. *Journal of Applied Polymer Science* **100**, 2604–2613 (2006).
48. Mukherjee, A., Raichur, A. M. & Modak, J. M. Dissolution studies on TiO₂ with organics. *Chemosphere* **61**, 585–588 (2005).
49. Sarkar, D. & Modak, J. M. Pareto-optimal solutions for multi-objective optimization of fed-batch bioreactors using nondominated sorting genetic algorithm. *Chemical Engineering Science* **60**, 481–492 (2005).
50. Kumar, R., Modak, J. & Madras, G. Effect of the chain length of the acid on the enzymatic synthesis of flavors in supercritical carbon dioxide. *Biochemical Engineering Journal* **23**, 199–202 (2005).
51. Mukherjee, A., Raichur, A. M., Modak, J. M. & Natarajan, K. A. Dissolution of Cu, Co and Ni from ocean nodules by L-ascorbic acid. *Chemical Engineering and Processing: Process Intensification* **44**, 754–759 (2005).
52. Chandraprabha, M. N., Modak, J. M., Natarajan, K. A. & Raichur, A. M. Experimental And Modeling Studies On The Inhibition Effect Of Solution Conditions On Activity Of Thiobacillus ferrooxidans During Biooxidation Of Mixed Sulphidic Concentrates. in *Biohydrometallurgy: a sustainable technology in evolution* (eds. Tsezos, M., Remoudaki, E. & Hatzikioseyan, A.) 1099–1108 (Nat Tech University of Athens, 2004).
53. Mukherjee, A., Raichur, A. M., Modak, J. M. & Natarajan, K. A. A novel bio-leaching process to recover valuable metals from Indian Ocean nodules using a marine isolate. in *Biohydrometallurgy: a sustainable technology in evolution* (eds. Tsezos, M., Remoudaki, E. & Hatzikioseyan, A.) 25–34 (Nat Tech University of Athens, 2004).
54. Mukherjee, A., Raichur, A. M., Modak, J. M. & Natarajan, K. A. Biologically assisted dissolution of some valuable metals from Indian Ocean nodules. in *International Seminar on Mineral Processing Technology (MPT-2004)* (eds. Rao, G. V. & Misra, V. N.) 732–738 (Allied Publishers Private Limited, Mumbai, 2004).
55. Chandraprabha, M. N., Modak, J. M. & Natarajan, K. A. Effect of solution conditions and pulp density on biooxidation of refractory gold ores by *Acidithiobacillus ferrooxidans*. in *International Seminar on Mineral Processing Technology (MPT-2004)* (eds. Rao, G. V. & Misra, V. N.) 654–661 (Allied Publishers Private Limited, Mumbai, 2004).
56. Kumar, R., Madras, G. & Modak, J. Enzymatic Synthesis of Ethyl Palmitate in Supercritical Carbon Dioxide. *Industrial and Engineering Chemistry Research* **43**, 1568–1573 (2004).
57. Mukherjee, A., Raichur, A. M., Natarajan, K. A. & Modak, J. M. Recent developments in processing ocean manganese nodules - A critical review. *Mineral Processing and Extractive Metallurgy Review* **25**, 91–127 (2004).
58. Mukherjee, A., Raichur, A. M., Modak, J. M. & Natarajan, K. A. Exploring process options to enhance metal dissolution in bioleaching of Indian Ocean nodules. *Journal of Chemical Technology and Biotechnology* **79**, 512–517 (2004).
59. Sarkar, D. & Modak, J. M. Optimization of fed-batch bioreactors using genetic algorithm: Multiple control variables. in *Computers and Chemical Engineering*, 789–798 (2004)
60. Mukherjee, A., Raichur, A. M., Modak, J. M. & Natarajan, K. A. Bioprocessing of polymetallic Indian Ocean nodules using a marine isolate. *Hydrometallurgy* **73**, 205–213 (2004).
61. Ravindra, P. N., Modak, J. M. & Ramalingaiah. Dynamic modelling of innovative activated sludge process. *Journal of Indian Water Works Association* **36**, 165–173 (2004)..

62. Chanda, M., Sarkar, A. & Modak, J. M. Ethoxylated polyethylenimine gel-coated on textile-grade acrylic fiber. A thermally regenerable superfast sorbent for water desalination. *Journal of Applied Polymer Science* **93**, 883–893 (2004).
63. Chandraprabha, M. N., Natarajan, K. A. & Modak, J. M. Selective separation of pyrite and chalcopyrite by biomodulation. *Colloids and Surfaces B: Biointerfaces* **37**, 93–100 (2004).
64. Sarkar, D. & Modak, J. M. Genetic algorithms with filters for optimal control problems in fed-batch bioreactors. *Bioprocess and Biosystems Engineering* **26**, 295–306 (2004).
65. Chanakya, H. N., Rajabapaiah, P. & Modak, J. M. Evolving biomass-based biogas plants: The ASTRA experience. *Current Science* **87**, 917–925 (2004).
66. Mukherjee, A., Raichur, A. M., Modak, J. M. & Natarajan, K. A. Mechanisms for solubilization of cobalt, copper and nickel from Indian Ocean nodules at near neutral pH by a marine isolate. *Journal of Industrial Microbiology and Biotechnology* **31**, 462–468 (2004).
67. Madras, G., Kumar, R. & Modak, J. Synthesis of octyl palmitate in various supercritical fluids. *Industrial and Engineering Chemistry Research* **43**, 7697–7701 (2004)..
68. Mukherjee, A., Raichur, A. M., Modak, J. M. & Natarajan, K. A. Bio-processing of Indian Ocean nodules using a marine isolate-effect of organics. *Minerals Engineering* **16**, 651–657 (2003).
69. Sarkar, D. & Modak, J. M. ANNSA: A hybrid artificial neural network/simulated annealing algorithm for optimal control problems. *Chemical Engineering Science* **58**, 3131–3142 (2003).
70. Chandraprabha, M. N., Modak, J. M., Natarajan, K. A. & Raichur, A. M. Modeling and analysis of biooxidation of gold bearing pyrite-arsenopyrite concentrates by *Thiobacillus ferrooxidans*. *Biotechnology Progress* **19**, 1244–1254 (2003).
71. Madras, G., Kulkarni, C. & Modak, J. Modeling the solubilities of fatty acids in supercritical carbon dioxide. *Fluid Phase Equilibria* **209**, 207–213 (2003).
72. Srivastava, S., Madras, G. & Modak, J. Esterification of myristic acid in supercritical carbon dioxide. *Journal of Supercritical Fluids* **27**, 55–64 (2003).
73. Mukherjee, A., Raichur, A. M., Modak, J. M. & Natarajan, K. A. Solubilization of cobalt from ocean nodules at neutral pH - A novel bioprocess. *Journal of Industrial Microbiology and Biotechnology* **30**, 606–612 (2003).
74. Sarkar, D. & Modak, J. M. Optimisation of fed-batch bioreactors using genetic algorithms. *Chemical Engineering Science* **58**, 2283–2296 (2003).
75. Karmarkar, A., Aggarwal, P., Modak, J. & Chanda, M. Grafting of m-isopropenyl- α , α -dimethylbenzyl-isocyanate (m-TMI) onto isotactic polypropylene: Synthesis and characterization. *Journal of Polymer Materials* **20**, 101–107 (2003).
76. Sarkar, D. & Modak, J. M. Optimisation of fed-batch bioreactors using genetic algorithms: Two control variables. *Computer Aided Chemical Engineering* **14**, 1127–1132 (2003).
77. Srivastava, S., Modak, J. & Madras, G. Enzymatic synthesis of flavors in supercritical carbon dioxide. *Industrial and Engineering Chemistry Research* **41**, 1940–1945 (2002).
78. Chandraprabha, M. N., Modak, J. M., Natarajan, K. A. & Raichur, A. M. Strategies for efficient start-up of continuous biooxidation process for refractory gold ores. *Minerals Engineering* **15**, 751–753 (2002).
79. Modak, J., Deckwer, W. D. & Zeng, A. P. Metabolic control analysis of eucaryotic pyruvate dehydrogenase multienzyme complex. *Biotechnology Progress* **18**, 1157–1169 (2002).
80. Zeng, A. P., Modak, J. & Deckwer, W. D. Nonlinear dynamics of eucaryotic pyruvate dehydrogenase multienzyme complex: Decarboxylation rate, oscillations, and multiplicity. *Biotechnology Progress* **18**, 1265–1276 (2002).

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82. Modak, J. M., Vasan, S. S. & Natarajan, K. A. Calcium removal from bauxite using *Paenibacillus polymyxa*. in *Mineral biotechnology. Microbial aspects of mineral beneficiation, metal extraction, and environmental control* (eds. Kawatra S K & Natarajan, K. A.) 183–190 (Society for Mining, Metallurgy, and Exploration (SME), USA, 2001).
83. Natarajan, K. A., Modak, J. M. & Raichur, A. M. Bioreactor Engineering for treating refractory gold-bearing concentrates: An Indian Experience. in *Biohydrometallurgy: Fundamentals, Technology and Sustainable Development, Part A* (eds. Ciminelli, V. S. T. & Garcia Jr., O.) 183–190 (Elsevier B.V., Amsterdam, 2001).
84. Chandraprabha, M. N., Modak, J. M., Raichur, A. M. & Natarajan, K. A. Modeling of biooxidation of gold bearing pyrite-arsenopyrite concentrates by *Thiobacillus ferrooxidans*. in *Biohydrometallurgy: Fundamentals, Technology and Sustainable Development, Part A* (eds. Ciminelli, V. S. T. & Garcia Jr., O.) 43–54 (Elsevier B.V., Amsterdam, 2001).
85. Vasan, S. S., Modak, J. M. & Natarajan, K. A. Some recent advances in the bioprocessing of bauxite. *International Journal of Mineral Processing* **62**, 173–186 (2001).
86. Banerjee, I., Modak, J. M., Bandopadhyay, K., Das, D. & Maiti, B. R. Mathematical model for evaluation of mass transfer limitations in phenol biodegradation by immobilized *Pseudomonas putida*. *Journal of Biotechnology* **87**, 211–223 (2001).
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34. Jayant M. Modak, Dynamic optimization of bioreactor, National conference on frontiers in chemical engineering, Guwahati, 2007.
35. Jayant M. Modak, Chemical Engineering Education in India – a comparative study with US., AIChE Annual conference, Philadelphia, November 2008.
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37. R Gupta, JM Modak, Modeling and Experimental Approach Towards of Photoelectrocatalytic Bacterial Inactivation of *E.coli* Using Vertically Aligned ZnO/CuI for Water Treatment, AIChE Annual Meeting, 2018
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2. Jayant M. Modak, Biohydrometallurgy of Sulphide Minerals, Bombay Technologist, 50, 111-121, 2002.
3. Jayant M. Modak, Haber Process for Ammonia Synthesis, Resonance, 7, 69-77, 2002.
4. Jayant M. Modak, Technology development for bio-oxidation of refractory sulphidic gold concentrates, Advanced Biotechnology, 2, 30-32, 2003

RESEARCH

Graduate Students Theses Supervised

ME –	completed: 31, in progress: 0
M. Sc.(Engg.)	completed: 14, in progress: 0
Ph.D.	completed: 15, in progress: 1

Ph.D.

1. **Shrihari**, Bacterial Leaching of Sulphide Minerals, 1994.
 2. **G. Mugeraya**, Studies of the Production of Cellulose Enzyme by Thermophilic Fungus *Thermoascus Aurantiacus*, 1996.
 3. **M. Rajendra. Prasad**, Studies on Multiphase and Multienzyme Oxidation of Glucose, 1997.
 4. **P. Shridhar**, Analysis of Protein Purification by Affinity Chromatography, 1998.
 5. **Debasis Sarkar**, Application of Genetic Algorithms for Fermentation Processes, 2004.
 6. **Chandraprabha**, Surface Studies on Sulphidic Minerals and Acidithiobacillus Bacteria With Respect to Biobeneficiation and Bioremediation 2007.
 7. **Ajay Karmarkar**, Wood Fibre Filled Polyolefin Composites 2008.
 8. **Kaksaheb Konde**, Engineering Analysis of Pichia Fermentation, 2008.
 9. **Sharad Sontakke M.**, Inactivation of Microorganisms by Photocatalysis, 2011.
 10. **Aravinda Reddy Mandli**, an Application of Cybernetic Principles to the Modelling and Optimisation of Bioreactors, 2015.
 11. **Simna Mahonaran**, Engineering the N-Glycosylation Pathway in Pichia Pastoris for the Expression of Glycoprotein Hormones, 2017
 12. **Rimzim Gupta**, an Approach Towards Inactivation of Susceptible and Antibiotic Resistant Bacterial Contamination Using Novel Photo-(Electro)-Catalysts, 2019
 13. **Neha Lamba**, Synthesis of Fatty Acid Methyl Esters and Solubilities of Lipid Derivatives in Supercritical Fluids, 2020.
 14. **CH Anil**, Development of Coke-Tolerant and Stable Ionic Catalysts for Dry Reforming of Methane and CO Abatement, 2020
 15. **V Mani Rathnam**, Non-Catalytic Synthesis of Biodiesel and Solubilities of Mixtures of Lipid Derivatives in Supercritical Fluids, 2020.
 16. **Bhanupriya Bourah**, Photocatalytic and Photoelectrocatalytic Systems for Water Remediation and Energy Applications, in progress
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M. Sc.(Engg.)

1. **S. Rajagopalan**, Heat and mass transfer studies in solid state fermentations, 1993.
2. **S. Suresh**, Studies on oxidation of benzylidene derivatives, 1995.
3. **T Ramasudha**, Biobeneficiation of bauxite using *Aspergillus niger*, 1996.
4. **Bodhisattwa Chaudhury**, Optimization of fed-batch fermentation processes with neural networks, 1996.
5. **J. Maria Thomas**, Biosorption of chromium using *Aspergillus niger*, 1997.
6. **S. S. Vasan**, Biobeneficiation of bauxite using *Bacillus polymyxa*, 1998.
7. **S. Jaisankar**, Studies on ferrous oxidation by *Thiobacillus ferrooxidans* immobilised on polyurethane foam, 2000.
8. **Baisakhi Sen**, Modeling and simulation of mammalian cell culture in hollow fiber bioreactor, 2001.
9. **Shrish Srivastava**, Enzymatic reaction in supercritical carbon dioxide, 2002.

10. Prashant Kumar Samantaray, Modeling of adsorption of metal ion on bacterial surface, 2002.
 11. Kakasaheb K. Konde, Sensitivity analysis of bioreactors using metabolic control analysis approach, 2003.
 12. Rajneesh Kumar, Enzymatic synthesis of esters in supercritical fluids, 2003.
 13. Suryawanshi Tukaram R, Computational fluid dynamic modeling of anaerobic bioreactor, 2006.
 14. Kaujalgi Saurabh Subhash, Oxygen transfer in Pichia pastoris fermentation, 2007.
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1. David A. G. Soares, Design of a self tuning regulator for adaptive control of a fed-batch fermentation processes, 1991.
2. Ch.V. Subba Rao, Kinetic studies of multiphase multienzyme reactions, 1993,.
3. Debasis Sarkar, Neural networks for modelling and optimization of bioreactors, 1993.
4. Girish Menon, Beneficiation of bauxite with organic acids, 1994.
5. Basudeb Saha, Biosorption of copper and zinc from aqueous solutions using waste biomass, 1994.
6. Venkatsubramaniam, Optimization of extractive fed-batch fermentation processes, 1995,
7. R. Anand Kumar, Modeling of hollow fiber bioreactor for mammalian cell culture, 1996.
8. Ambica Nagappa, Biosorption metal ions using biopolymer gels, 1997.
9. K. Ravishankar, Separation of amino acids by expanded bed chromatography, 1997.
10. Reshmi Dutta, Investigations of influence of secondary flows in hollow fiber bioreactor, 1998.
11. Ipsita Banerjee, Modeling of phenol biodegradation using immobilised Pseudomonas putida, 1998.
12. Satish Kadu, Secondary flow Modeling of in hollow fiber bioreactors, 1999.
13. Amit Saxena, Cerebellar Model Neural Networks, 1999.
14. Rajesh Arora, Equilibrium Modeling of biosorption: A statistical thermodynamic approach, 2000.
15. Ajay Oreon, Metabolic network modeling of glycerol fermentation, 2002.
16. Pranjan Kumar Das, Application of metabolic control analysis to continuous bio-oxidation, 2002,
17. Murali Ch., Modeling of solid state fermenter Plafractor, 2003.
18. Shaik Osman Shahi, Optimal control of packed bed bioreactors, 2003.
19. Paresh Jain, CFD Modeling of solid state fermentation process, 2004.
20. Ankit Shukla, Computational fluid dynamic study of heap bleaching process, 2006.
21. Tamaghna Chakraborti, Optimization of protein crystallization using optimal control theory and genetic algorithm, 2006.
22. Matthew John, Computational Fluid Dynamics modeling of anaerobic bioreactor, 2007.
23. Santosh Tatepalli, Process development for selective hydroxylation of benzofuran and its derivatives, 2007.
24. M Aravinda Reddy, Optimization of singular control problems using genetic algorithm, 2008.
25. B Kankaiaha, Catalysis using polyelectrolyte multilayer films, 2008.
26. Jawid Naik, Hydrodynamics and mass transfer performance of Cultibag STR 200, 2011.

27. Rajasekhar, Hydrodynamics and mass transfer characterization of bioreactors using CFD, 2012.
28. Md.Aslam Ansari, Computational Fluid Dynamic (CFD) modeling of algal photobioreactors, 2013.
29. Saket Kumar, Scaleup of disposable bioreactors using Computational Fluid Dynamics, 2013.
30. Nirmal Kumar, Inactivation of Escheria coliform by Photocatalysis, 2014.
31. P Arjun Kumar, Modeling of algal raceway ponds using computational fluid dynamics, 2015

Undergraduates

1. G. Sankaranarayanan, Nonideal Mixing in Bioreactors, 1990.
2. S. S. Murthy, Modelling and Design of Pure Phase Anaerobic Fermenter, 1992.
3. A. Raj, Methanogenesis in Pure Phase Anaerobic Fermenter, 1992.
4. J. Sundaresan, Kinetics of Methane Formation, 1993.
5. K.Arun Kumar, Methanogenesis in an Anaerobic Solid Phase Leaf Biomass Fermenter, 1993.
6. R.Venkatsubramaniam, Determination of decomposition kinetics of biomass substrates in a solid phase fermentor, 1996.
7. Nilesh, Modeling solid phase fermentor for biogas generation, 1996.

TEACHING

I. Courses taught in Department of Chemical Engineering

CH 204: Chemical Reaction Engineering
 CH 231: Biochemical Engineering
 CH 237: Topics in Optimization
 CH 258: Introduction To Biotechnology
 UG 302: Design Principles in Environmental Engineering

2. Courses taught at Purdue University

ChE 348: Chemical Reaction Engineering
 ChE 434: Senior Laboratory
 ChE 435: Senior Design Project Laboratory

3. Other Courses

- i. Introduction To Biotechnology under Proficiency Program in 1990-1992,1995.
- ii. Lectures on Bioreactor Engineering in short term intensive course titled Biohydrometallurgy held at Indian Institute of Science, Bangalore in February 1994.
- iii. Lectures on Modeling of Bioreactors in short term intensive course titled Bioreactors held at Regional Research Laboratory, Thiruvananthapuram in March 1994.
- iv. Lectures on Optimization of bioreactors using neural network model in short term intensive course titled Neural networks in chemical process engineering held at Indian Institute of Science, Bangalore 560012 in February 1996.

- v. Coordinator and Teacher for two week intensive course titled Modeling of Bioreactors held at Indian Institute of Science, Bangalore 560012 in March 1998 and January 2006.
- vi. Lectures on Fed-batch fermentation processes and Modeling of Bioreactors in short term course titled Fermentation strategies and bioreactor selection held at Indian Institute of Technology, Hyderabad, May 1999.
- vii. Bioprocess Engineering course under Proficiency Program of IISc, Jan-Apr, 2002
- viii. Bioprocess Engineering a short term course for Sartorius India Pvt. Ltd., July-August 2002
- ix. Bioprocess Engineering course under Proficiency Program of IISc, Aug-Dec, 2002, 2003
- x. Chemical Reaction Engineering, NPTEL video course, 2010