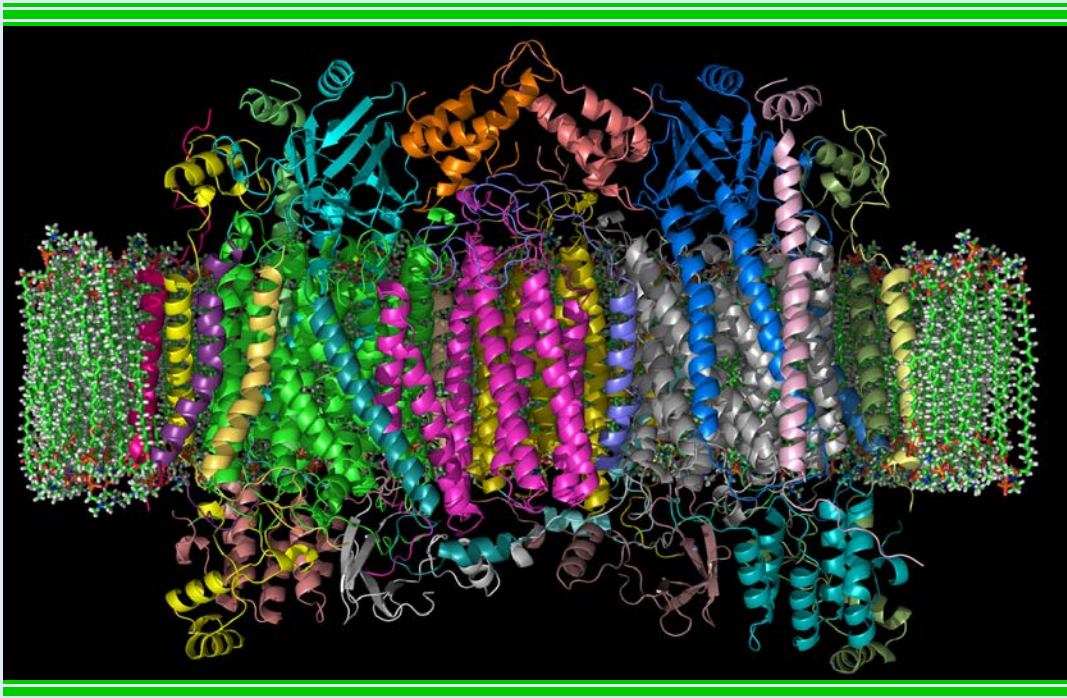


B3-IV

**Department of Chemical
Sciences
(DCS)**



Department of Chemical Sciences

1. Name of the Department :

Department of Chemical Sciences

2. Year of establishment :

The Department started in 1953 as a research group on Nuclear Electron Magnetism. The group was later divided into the Chemical Physics Group and Solid State Physics Group in 1967. The Chemical Physics Group then changed its name to the present Department of Chemical Sciences in the year 1997.

3. Is the Department part of a School/Faculty of the university? :

It is a part of Faculty of Natural Sciences.

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

- Ph.D.

- Integrated M.Sc.-Ph.D.

5. Interdisciplinary programmes and departments involved

None

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

None

7. Details of programmes discontinued, if any, with reasons

We have not discontinued any program, per se. However, we have stopped admitting any B.Sc. students in the Ph.D. program from August 2015. Earlier, students with a B. Sc. degree, joining the Ph. D. programme, used to take extra courses and write a thesis on a small project in order to get an M.Sc. degree en route to a Ph.D. From 2015 onwards they are enrolled in the Integrated M.Sc.-

Ph.D. program in conformation with the UGC guidelines.

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System –

Students of the DCS are offered a Course Work programme based on a mixture of compulsory Core Courses, choice-based Elective Courses and two compulsory Project Work on topics of their own choice. The detailed structure is given in the table below.

Programme	Duration (years)		Course Credits	Project Credits	Short thesis	Total Credits
	Overall	Coursework				
Ph.D.	5	1.5	26	34	–	60
Integrated M.Sc.- Ph.D.	6	2.5	42	34	24	100

The Academic Session is divided into two semesters: the Autumn Semester (August – November) and the Spring Semester (February – May). In addition, a short course is offered in July.

In each one-semester course, students are evaluated by a Continuous Evaluation process consisting of

1. Assignments
2. Quizzes
3. Mid-semester Examination
4. End-semester Examination
5. Term paper (optional)

9. Participation of the department in the courses offered by other departments

For fulfilling the course requirements of the Integrated M.Sc.- Ph.D. programme, some chemistry students take courses offered by other departments and vice-versa.

10. Number of faculty positions:

	Faculty Designation with DAE Grade	Abbreviation (Item 11)	Number
1.	Senior Professor (I)	Sr. Professor (I)	4
2.	Professor (H)	—	2
3.	Associate Professor (G)	Assoc. Professor (G)	4
4.	Reader (F)	—	4
5.	Fellow (E)	—	—
Total			14

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

	Name	Deg.*	Designation	Specialization	Exp [†]	Stu [‡]
1	R. V. Hosur	Ph. D.	Sr. Professor (I)	Molecular Biophysics, Structural Biology, Biomolecular NMR, Biophysical Chemistry	38	4
2	K.V.R. Chary ^{††}	Ph. D.	Sr. Professor (I)	Molecular Biophysics, Structural Biology and Biological Chemistry and NMR	33	6
3	Sanjay Wategaonkar	Ph.D.	Sr. Professor (I)	Physical Chemistry, Laser Spectroscopy, Supersonic Jet Spectroscopy, Hydrogen bonding, Quantum Chemical Computation	31	4
4	Shyamalava Mazumdar	Ph. D.	Sr. Professor (I)	BioInorganic Chemistry, Biophysics, Spectroscopy, Enzyme kinetics	25	5
5	Sudipta Maiti	Ph. D.	Professor (H)	Biophysics and spectroscopy	21	6
6	P. K. Madhu ^{††}	Ph. D.	Professor (H)	NMR spectroscopy and biophysics	18	5
7	H.M. Sonawat	Ph. D.	Assoc. Professor (G)	Biochemistry & Metabolomics	33	2
8	Ranjan Das	Ph. D.	Assoc. Professor (G)	EPR spectroscopy, spin dynamics, Physical Chemistry, Chemical Physics	27	2
9	Deepa Khushalani	Ph.D.	Assoc. Professor (G)	Materials Chemistry	14	3
10	A. S. R. Koti	Ph. D.	Assoc. Professor (G)	Mechanochemistry, Engineering novel proteins with diverse mechanical functions, Development of novel single-molecule assays for protein-protein, protein-DNA, and protein-RNA interactions	7	3
11	Vivek	Ph. D.	Reader	Nanocatalysis	6	4

	Polshettiwar					
12	Ankona Datta	Ph. D.	Reader	Chemical Biology	5	5
13	J. Dasgupta	Ph. D.	Reader	Physical Chemistry	5	5
14	Ravindra Venkaramani	Ph. D.	Reader	Computational Chemistry	3	2

*Highest degree obtained

† Years of Experience as a regular Faculty Member (TIFR and elsewhere)

‡ Ph.D. students guided within the last 4 years (including those joined and those graduated)

†† Also associated with TIFR Centre for Interdisciplinary Sciences (TCIS), Hyderabad.

12. List of senior visiting fellows, adjunct faculty, emeritus professors

Adjunct Faculty :

1. Prof. Amnon Horovitz (Duration: 2015-18), Carl and Dorothy Bennett Professorial Chair in Biochemistry, Department of Structural Biology, Weizmann Institute of Science, Rehovot, Israel
2. Prof. Daniel Huster (Duration: 2015-18), Professor of Medical Biophysics, Universität Leipzig, Faculty of Medicine, Institute of Medical Physics and Biophysics für Medizinische Physik und Biophysik, Härtelstraße 16 – 18, 04107 Leipzig
3. Prof. Vinod Subramaniyan (Duration: 2009-12) University of Twente, The Netherlands
4. Prof. S. Ramakrishnan (Duration : 2004-07) Indian Institute of Science, Bangalore
5. Prof. Malcolm H. Levitt, (Duration 2005-11) University of Southampton, UK

13. Percentage of classes taken by temporary faculty – programme-wise information:

Nil. As per our standards and policy all courses are taught by regular faculty members. However, distinguished visiting scientists spending an extended period in the Department have occasionally offered graduate courses for the students.

14. Programme-wise Student Teacher Ratio:

	Programme	Students (S)	Faculty (F)	Ratio S/F
1.	Ph.D.	32	14	2.3
2.	Integrated M.Sc.-Ph.D.	2	14	0.7

15. Number of academic support staff (technical) and administrative staff:

Scientific and Technical Staff	Administrative and auxiliary Staff
14	2

16. Research thrust areas as recognized by major funding agencies

Major funding is from the Department of Atomic energy, Govt. of India, for carrying out research in the modern areas of chemistry. Emphasis is on biophysics and structural biology, biochemistry-biology interface, chemistry of materials, and spectroscopy and dynamics of fundamental photophysical and photochemical interactions. Funding is also received periodically from DST and DBT.

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

National

	Agency	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	DST-DIIRTE (India-Australia)	Tailoring plant protease inhibitors for control of the crop pest <i>helicoverpa armigera</i>	56.104	2014-2016	K.V.R. Chary
2.	Indo-	Solid-state NMR methods and		2015-	P.K. Madhu

	Danish	applications		2017	
3.	DST-CEFIPRA (India-France)	Novel nanocatalysts synthesis guided by DNP NMR	120		P.K. Madhu, Vivek Polshettiwar
4.	DBT	Conjugation of engineered cytochrome P450 enzyme onto functionalized carbon nanotubes for bioelectrochemical degradation of pesticides and other pollutants	38		S.Mazumdar
5.	DBT (India-Australia)	Molecular recognition between alkane hydroxylase and rubredoxin in alkane degrading bacteria	50		S. Mazumdar

18. Inter-institutional collaborative projects and associated grants received

a) National collaboration :

- Ankona Datta and Dr. Ravi Manjithaya (JNCASR, Bangalore); Development of sensors for detecting autophagy;
- Deepa Khushalani: S Haram, University of Pune “Development of novel anodes for supercapacitor applications”
- P.K.Madhu: N. D. Kurur, IIT Delhi
- S. Mazumdar: DBT - Conjugation of engineered cytochrome P450 enzyme onto functionalized carbon nanotubes for bioelectrochemical degradation of pesticides and other pollutants’ – Rs. 38 Lakhs (in collaboration with Prof S. K Haram, Univ. of Pune);
- Vivek Polshettiwar : Dr. C. Gopinath, NCL, Pune; Prof. Bhanage, ICT, Mumbai; Prof. D. Maity, IIT, Bombay, Mumbai.

b) International collaboration :

- Dr. Ankona Datta and Dr. Michal Neeman (Weizmann Institute of Science) Development of ^{19}F -MRI probes for detecting Manganese
- Deepa Khushalani: Dr. Ivana Evans: Durham University, UK. "In-Situ XRD studies of metal complexes"
- Vivek Polshettiwar: Prof. Olivier Lafon, Lille University, France, "DNP enhanced NMR of Nanocatalysts"

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

	Agency	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	DAE	XII Plan Project – DCS (14 projects)	4094	2012-17	All DCS faculty

20. Research facility / centre with

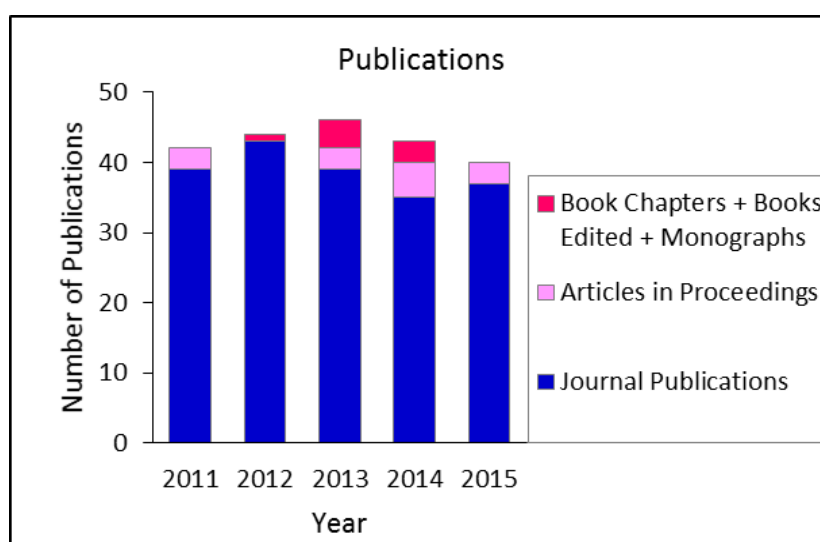
- state recognition: --
- national recognition : National Facility for High-Field NMR
- international recognition: --

21. Special research laboratories sponsored by / created by industry or corporate bodies

Prof. Sudipta Maiti; Microscopy Research Facility partially sponsored by M/S Zeiss Inc., Germany.

22. Publications:

DCS	Journal Publications	Articles in Proceedings	Technical Reports	Web Publications	Book Chapters	Books Edited	Monographs
2010-11	39	3	0	0	0	0	0
2011-12	43	0	0	0	1	0	0
2012-13	39	3	0	0	3	1	0
2013-14	35	5	0	0	3	0	0
2014-15	37	3	0	0	0	0	0
Total	193	14	0	0	7	1	



- Books with ISBN with details of publishers:
Vivek Polshettiwar - "Nanocatalysis: Synthesis and Applications", Eds Vivek Polshettiwar and Teddy Asefa; 2013, ISBN: 978-1-1181-4886-0, by WILEY. <http://eu.wiley.com/WileyCDA/WileyTitle/productCd-111814886X.html>
- Citation Index – range / average :
 - Total number of citations-24569 (for 13 members)
 - Number of citations per faculty-1890
- h-index:
 - Range- 6-39

23. Details of patents and income generated N/A
24. Areas of consultancy and income generated: NIL
25. Faculty selected nationally / internationally to visit other laboratories / institutions / industries in India and abroad:

National

	Name of Faculty member	Place visited	Date (MM/YYYY)
1.	K.V.R. Chary	BHU, Varanasi BHU, Varanasi Saurashtra University, Rajkot	March 2011 January 2013 February 2013
2.	Shyamalava Mazumdar	Indian Institute of Science, Bangalore	Sept 26 & 27, 2014

International

	Name of Faculty member	Place visited	Date (MM/YYYY)
1.	R. V. Hosur	Stanford University, University of California at Berkeley, Michigan University, USA National University of Singapore Stanford University, USA	2010 March 2014 March 2014
2.	K.V.R. Chary	CERM, Florence, Italy ETH, Zurich, Switzerland CERM, Florence, Italy Goethe University, Germany Shanghai Inst. of Organic Chemistry, China University of Queensland, Australia University of Melbourne, Australia Monash University, Australia University of Queensland, Australia University of New South Wales, Australia	July 2010 July 2010 May 2011 August 2011 October 2011 October 2013 October 2013 October 2013 August 2014 August 2014
3.	Sanjay Wategaonkar	University of Basque Country, Spain	July 2014
4.	P. K. Madhu	University of Halle and University of Leipzig, Germany, University of Lille, Lille, France, University of Province, France University of York, UK Max Planck Inst, Goettingen, Germany	May 2010 June 2010 June-August 2011 August 2011 May-June 2013

	Name of Faculty member	Place visited	Date (MM/YYYY)
		Max Planck Inst, Goettingen, Germany University of Leipzig, Germany, ETH Zurich, Switzerland Weizmann Institute of Science, Israel Tel Aviv University, Israel ETH Zurich, Switzerland	September 2013 May 2013 July 2013 Oct. 2013 Oct. 2013 June 2014
5.	Ranjan Das	Graz University of Technology, Austria	April 2013
6.	A. S. R. Koti	Western University and Columbia University, USA University of Cambridge, UK	March 2011 November 2011
7.	J. Dasgupta	Free University of Berlin, Germany University of California, Berkeley, USA Weizmann Inst. of Science, Israel	July 2011 September 2011 June 2014

26. Faculty serving in

(a) National Committees :

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
1	Prof. R.V. Hosur	Centre for Biomedical Magnetic Resonance, Lucknow	Council Member	2006-
		Research Council of IICB, Kolkata	Member	2007-11
		Governing Council, UM-DSE CBS	Member	2009-
		Indian National Science Academy	Member	2008-10
		National Academy of Sciences, India	Member	2009-11,13
		Fellowship Committee of NASI	Member	2009-
		Expert Panel of Bose Institute, Kolkata	Member	
		National Magnetic Resonance Society, India	President	2009-12
		Narottam Sekhsaria Foundation;	Expert	2008-10
		NASI Platinum Jubilee Young Scientist Award selection committee	Member	2009-
		INSPIRE Faculty Selection Committee	Chairperson	2014
		Summer Research Fellowship Committee, Indian Academy of Sciences	Member	2014
		DBT-IISc Review Committee	Member	2014
		DST-SRC Young Scientist Award	Member	2014

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
		Committee		
		DBT Task Force on Modern Biology	Member	2014
2	Prof. K.V.R. Chary	Indian Biophysical Society	President	2011-13
		Project Management Committee of the 600 MHz NMR Facility, Indian Institute of Chemical Biology, Kolkata	Member	2010
		Royal Society of Chemistry, West India Section	Executive Council Member, Elected Hon. Chairman	2010
		Indian Science Congress Association, Mumbai Chapter	Convener	2010
		Tata Endowment Selection Committee, Mumbai	Member	2010
		National Magnetic Resonance Society	Member	
		Expert Committee for Review for the Dept. of Biotechnology, IIT Roorkee	Member	2014
3	Prof. Sudipta Maiti	Working Group on Photonics, Dept. of Information Technology, Govt. of India	Member	2011
		Indian Biophysical Society	Executive Body Member	2012
		Scientific Advisory Committee, National Brain Research Centre	Member	2014
4	Prof. S. Mazumdar	Programme Advisory Committee, Department of Science and Technology, India	Member	2011
		Syllabus Committee, University of Mumbai	Member	2011
		National Organizing Committee, Modern Trends in Inorganic Chemistry	Member	2014
		DBT Task Force on Nanobiotechnology	Member	2014-
5	Prof. S.J. Wategaonkar	Executive Council, Indian Society for Radiation and Photochemical Sciences	Member	2010
		Executive Council, Indian Society for Radiation and Photochemical Sciences	Secretary and Executive Council Member	2014
		Executive Council, Indian Society for Radiation and Photochemical Sciences	Vice President	2015

(b) International Committees:

	Name of the Faculty Member	Name of the Committee	Role of the Committee	Term of Service
1	Prof. R.V. Hosur	International Conferences on Magnetic Resonance in Biological Systems	Council Member	2004-14
		ISMAR	Council member	2013-
		ISMAR scientific advisory committee	Member	2013-15
2	Prof. K.V.R. Chary	International Conferences on Magnetic Resonance in Biological Systems	Council Member	2005-14
		International Union for Pure and Applied Biophysics (IUPAB), "Task Force on NMR of Biological Systems	Secretary	2010
		International Council on Magnetic Resonance in Biological Systems	Chairperson	2012-14
3	Prof. P.K. Madhu	European School on Solid-State NMR	Advisor	2003-
		Board of Trustees of EUROMAR, European Magnetic Resonance Meeting	Member	2009-15
4	Prof. S. Mazumdar	Asian Biological Inorganic Chemistry	Steering Committee Member	2003-
5	Dr. Vivek Polshettiwar	Global Young Academy	Member	2014
6	Prof. S.J. Wategaonkar	International Steering Committee, Asian Spectroscopy Conference	Member	2012

(c) Editorial Boards :

	Name of the Faculty Member	Name of the Journal	Impact Factor	Term of Service
1	Prof. R.V. Hosur	Indian Journal of Biochemistry and Biophysics	0.871	2004-
		Scientific World Journal	-	2014-
2	Prof. K.V.R. Chary	Journal Current Bioinformatics	0.921	2005-
		The Open Applied Informatics Journal	-	2008-
		The Open Magnetic Resonance Journal	-	2007-
3	Prof. P.K. Madhu	Journal of spectroscopy and dynamics	-	2010-13
		Journal of Magnetic Resonance	2.510	2015-
		Journal of Biomolecular NMR	3.141	2015-
		Solid State Nuclear Magnetic Resonance	2.266	2015-
4	Prof. S.J. Wategaonkar	Journal of Chemical Science, Bangalore Physics Teacher	1.191 -	2015- 2011-

5.	Prof. Sudipta Maiti	Journal of Optics Frontiers in Physiology and Biophysics	2.059 3.534	2014- 2014-
6.	Dr. Vivek Polshettiwar	Scientific Reports	5.578	2014-
7.	Dr. J. Dasgupta	Scientific Reports	5.578	2014
8.	Prof. Deepa Khushalani	Scientific Reports	5.578	2014
9.	Dr. Ravindra Venkatramani	Scientific Reports	5.578	2014

d) any other (please specify)

Most faculty members frequently work as referees in many national and international journals, such as Journal Physical Chemistry, Journal of Chemical Physics, Chemical Physics Letters, Journal of Magnetic Resonance, Journal of the American Chemical Society, Pramana - J. Physics, Journal of Chemical Science, etc.

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs).

Young faculty members are entitled to get study-leave for spending extended periods in international laboratories and train themselves in the latest research areas. All faculty members are also entitled to go on sabbatical leave for working in international laboratories for 6 months to one year.

Members of the Department organise national and international meetings, workshops and seminars. These give them opportunities to showcase their research and also interact with experts.

In addition, national and international collaborative research programmes have frequent exchange of visits of our faculty members and their collaborators.

All these activities are catalysts for continuous recharging of our faculties.

In addition, DCS faculty members are in great demand as teachers in other institutions, both within India and abroad.

28. Student projects

- percentage of students who have done in-house projects including inter-departmental projects:

100% (All students do in-house 3 research projects as part of the curriculum.)

- percentage of students doing projects in collaboration with other universities / industry / institute

Approximately 75% of the Ph.D. students enrolled in TIFR are working on research projects that have a collaborative portion.

29. Awards / recognitions received at the national and international level by

- Faculty Members:**

National Awards

	Name of the Awardee	Name of the Award	Year
1	Prof. R. V. Hosur	Padma Shri	2014
		JC Bose National Fellowship	2007
		IIT-Bombay Distinguished Alumnus Award	2015
		BRUKER Young Scientist award	1983
		Fellow, Indian Academy of Science	1994
		Fellow, Indian National Science Academy	1995
		Fellow, National Academy of Sciences India	1997
		INSA Young Scientist Medal	1984
		CSIR Professor G N Ramachandran Gold Medal	2009
		B. M. Birla award	1992
		Yeddanapalli Memorial lecture award	2009
		R K Asundi Memorial Lecture Award, INSA	1998
		Jagdish Shankar memorial Lecture Award, INSA	2003
		B D Tilak Lecture award, Mumbai University	1989
		3 rd annual award, Society for cancer research	1998
	IICB-Kolkata Foundation Day Lecture award	2004	
	RRL-Trivandrum Foundation Day Lecture Award	2006	

	Name of the Awardee	Name of the Award	Year
		PC Ray Memorial Lecture award	2011
		Young Associate, Indian Academy of Science	1985
3	Prof. K.V.R. Chary	JC Bose National Fellowship	2014
		Fellow of Indian National Science Academy	2012
		Fellow of the Andhra Pradesh Academy of Sciences	2011
		Fellow of the National Academy of Sciences	2000
		J.C. Ghosh Memorial Award of the Indian Chemical Society	2009-10
		Anil Kumar Bose Memorial Award, INSA	1989
		Young Scientist Award, BRUKER	1986
		Young Scientist Medal, INSA	1986
		Professor Rango Krishna Asundi Memorial Lecture Award of Indian National Science Academy	2006
		Dharamsi Morarji Chemical Co. Visiting Fellowship in Chemistry" of the Institute of Chemical Technology	2010-11
3	Prof. P. K. Madhu	Fellow of the National Academy of Sciences	2010
4	Prof. S. Mazumdar	Fellow of the National Academy of Sciences	2014
		INSA Young Scientist Medal	1991
		Anil Kumar Bose Memorial Award, INSA	1996
5	Prof. Sudipta Maiti	SICO National Instrumentation Award from NASI	2001

International Awards

	Name of the Awardee	Name of the Award	Year
1.	Prof. K.V.R. Chary	Fellow, The World Academy of Sciences	2014
2.	Prof. R. V. Hosur	Fellow, The World Academy of Sciences	2008

• Students, Postdocs, Scientific Staff and Others:

National Awards

	Name of the Awardee	Name of the Award	Year
1.	Mr. Venus Singh Mithu	Best poster award in NMRS Meeting	2011
2.	Ms. Subha	Best poster award in New Directions in	2012

	Bakthavatsalam	Chemical Sciences	
3.	Mr. Vinayak Rane	Best poster award at TSRP Symposium	2012
4.	Mr. Biswajit Mishra	Best poster award at IUMRS-ICA 2013 (International Union of Materials Research Societies – International Conference in Asia)	2013
5.	Ms. Shama Parween	Best poster award at IUMRS-ICA 2013 (International Union of Materials Research Societies – International Conference in Asia)	2013
6.	Ms. Subha Bakthavatsalam	Best poster award in 13 th Eurasia Conference on Chemical Sciences	2014
7.	Mr. Bappaditya Chandra	Best poster award in NMRS Meeting	2014
8.		Best poster award at the TSRP Symposium	2014
9.	Ms. Kshama Sharma	Best poster award in NMRS Meeting	2015
10.	Mr. Rustam Singh	Best poster award in 4th International Conference on Advanced Nanomaterial and Nanotechnology	2015

International Awards

	Year	Name of the Awardee	Name of the Award
1.	2013	Ms. Aditi Bhattacharjee	Best poster award at the Hydrogen Bond meeting at Antwerp, Belgium
2.	2014	Mr. Hema Chandra Kotamarthi	Biophysical Society Student Research Achievement Award (SRAA) at San Francisco, USA.
3.	2015	Mr. Sanat Ghosh	Best poster award at the Hydrogen bond meeting 2015 at Wroclaw, Poland

30. Seminars/Conferences/Workshops organized and the source of funding (national / international) with details of outstanding participants, if any.

	Year	Name	Funding Agency	Faculty members
1.	2011	International work-shop on "Recent Advances in High Resolution NMR spectroscopy", Hyderabad	TIFR	Prof. K.V.R. Chary
2.	2014	NMR meets Biology, Goa	TIFR	Prof. P. K. Madhu
3.	2016	NMR meets Biology, Kerala	TIFR	Prof. P. K. Madhu
4.	2013	National Magnetic Resonance Symposium, Mumbai	TIFR	Prof. P. K. Madhu
5.	2013	Discussion Meetings on Spectroscopy and	TIFR	Prof. S. J. Wategaonkar

		Dynamics of Molecules and Clusters, Udaipur		
6.	2014	<i>Sustainable Energy: Crisis and Management, Latest Trends in Fundamental Research, Mumbai</i>	Royal Society of Chemistry	Prof. Deepa Khushalani
7.	2013	<i>National Symposium On New Vistas In Chemistry, Mumbai</i>	Royal Society of Chemistry	Prof. Deepa Khushalani

31. Code of ethics for research followed by the departments

Students must refrain from any kind of academic misconduct. The following are some examples of academic misconduct: copying of answer sheets either in the examination or home-work assignments, absenteeism from classes, fabrication or falsification of data/results, and indulgence in plagiarism. The acts listed above and any act that is not listed here and is perceived as an academic misconduct by the CSB will invite disciplinary action, which may be expulsion of the students engaged in such acts. These guidelines are published on the Departmental website (www.tifr.res.in/~dcs). In addition, the Institute has an overall Academic Ethics Policy which can be found at <http://www.tifr.res.in/index.php/intranet/guidelines-for-academic-ethics.html>

32. Student profile programme-wise:

Name of the Programme	Applications Recd	Selected		Joined		Pass percentage*	
		Male	Female	Male	Female	Male	Female
Ph.D.	13636 #	65	37	20	16	85	81

2014 and 2015 numbers include applications recd for TCIS, Hyd also

33. Diversity of students

a) Geographical

Students	Ph.D.		I-Ph.D.		Total
	Male	Female	Male	Female	
From the state where the university is located	0	1	0	0	1
From other states of India	15	8	4	6	33
NRI students	0	0	0	0	0
Foreign students	0	0	0	0	0
Total	15	9	4	6	34

b) Undergraduate Insitution

	Ph.D.		I-Ph.D.		Total
	Male	Female	Male	Female	
From Universities	10	7	4	6	27
From premier science institutions †	0	0	0	0	0
From premier professional institutions #	5	2	0	0	7
From others*	0	0	0	0	0
Foreign Universities	0	0	0	0	0
Total	15	9	4	6	34

† Science institutions, e.g. CBS, NISER, etc. # IITs, NITs, etc.

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

	Examination	No of students who cleared
1.	NET	More than 95% of the present students
2.	GATE	More than 95% of the present students

N. B. The students who did not have the NET/GATE certification were B.Sc. students.

35. Student progression

Our students after obtaining a Ph.D. or Integrated M.Sc.-Ph.D. degree usually pursue post-doctoral research work in eminent universities or institutions.

36. Diversity of staff (All faculty members are required to have a Ph.D. degree. They are recruited through a rigorous selection process according to their area of specialization, without any distinction made on their domicile status. In the following table, the faculty members are grouped according to their place of the institution that awarded them their Ph. D. degree.)

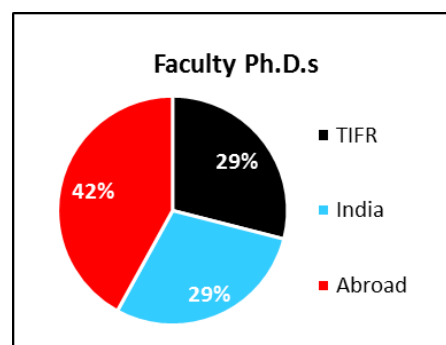
Number of faculty who are Ph.D.'s

from **TIFR** : 4*

from other institutions in **India** : 4

from institutions **Abroad**: 6

Total No 14



* These four members obtained their Ph.D. from Mumbai University; However, they did their Ph.D. research work in this Institution itself.

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period

The minimum eligibility criteria for selection as a member of the TIFR faculty is a Ph.D. degree. Thus, this number is not relevant.

38. Present details of departmental infrastructural facilities with regard to

a) Library

There is a common facility called Scientific Information Resource Centre that holds

the central library and provides modern IT based information from a wide variety of sources. It has a rich collection of books and monographs on several fields pertinent to our research work. It also has a wide collection of journals and periodicals, both in printed and electronic forms, accessible from all personal computers.

b) Internet facilities for staff and students

A campus-wide high-speed LAN offers internet access to all the staff and students, both in their offices and labs, and in large parts of the residential areas.

c) Total number of class rooms

DCS, like other Departments of TIFR in the Colaba campus, makes use of the common class rooms and lecture theatres of TIFR ([see Section B1, Item no 12](#))

d) Class rooms with ICT facility

All the classrooms above have ICT facilities like overhead projectors, Wi-Fi, etc. Video-conferencing facilities are also available in most lecture rooms.

e) Students' laboratories

There are no special laboratories marked for students. All the research laboratories (see item 'f' below) are accessible to all students whenever their work requires them to use the facilities in these labs.

f) Research laboratories

	Name of Laboratory	Fac*	PDF [†]	Stu [‡]	Major equipments/ instruments	Brief description of research activity
1	NMR & Structural Biology	2	0	3	500, 700 and 800 MHz NMR spectrometers from Brüker; 600 NMR spectrometer from Agilent	Molecular Biophysics, Structural Biology, Biomolecular NMR, Biophysical Chemistry
2	Supersonic Jet Spectroscopy	1	0	3	Supersonic jet spectrometer, Time-of-flight mass	Physical Chemistry, Laser Spectroscopy, Supersonic Jet

	Name of Laboratory	Fac*	PDF [†]	Stu [‡]	Major equipments/ instruments	Brief description of research activity
					spectrometer	Spectroscopy, Hydrogen bonding, Quantum Chemical Computation
3	Bioinorganic Chemistry	1	1	1	ESI-MS spectrometers, Potentialstat and galvanostat	Inorganic and Bio-chemistry
4	Biophotonics	1	1	3	Multi-photo microscope, fluorescence correlation spectrometer	Biophysics and spectroscopy
5	Solid State NMR	1	0	1	NMR spectrometers mentioned above, coupled with special probes for solid-state studies	NMR spectroscopy and biophysics
6	Cellular Biochemistry	1	0	0	NMR spectrometers mentioned above	In-vivo NMR and metabolomics
7	EPR Spectroscopy	1	0	0	Steady-state X-band EPR spectrometer from Brüker , Time-resolved X-band EPR spectrometer (laboratory build). Nano-second laser flash-photolysis setup (laboratory build).	EPR spectroscopy and spin dynamics of transient organic free radicals
8	Materials Chemistry	1	1	2	Surface area analyzers and thermal analyzers, Potentiostat for electrochemical measurement and solar simulator	Functional inorganic materials
9	Single Molecule Protein Mechanics	1	1	2	Atomic Force Microscope coupled to an optical microscope (commercial) and Laboratory built atomic force microscope	Mechanochemistry, Engineering novel proteins with diverse mechanical functions, Development of novel single-molecule assays for

	Name of Laboratory	Fac*	PDF [†]	Stu [‡]	Major equipments/instruments	Brief description of research activity
						protein-protein, protein-DNA, and protein-RNA interactions
10	Nanocatalysis	1	1	4	Microwave reactor, gas sorption analyzer, GC-MS	Nanomaterials for energy and environment
11	Chemical Biology & Molecular Imaging	1	0	5	Liquid Chromatography – mass spectrometry and relaxometer	Development of novel molecular probes for <i>in vivo</i> imaging
12	Ultrafast Biophysics & Photomaterials	1	1	3	Femto-second transient absorption spectrometer	Reaction dynamics of polyatomic systems
13	Computational Chemistry	1	0	2	Cluster computing facility	Theory and computations of molecular processes

* No. of faculty members using the laboratory

[†] No. of postdoctoral fellows using the laboratory

[‡] No. of graduate students using the laboratory

In addition, there are pico-second time-resolved fluorescence spectrometers and a MALD-TOF mass spectrometer, which are used by several members.

39. List of doctoral, post-doctoral students and Research Associates

a) from the host institution/university :

Doctoral – 33, Post-doctoral – 5, JRF - 4

	Doctoral students	Post-doctoral fellows
1.	Mr. Dwaipayan Dattagupta	Dr. Nisha Bayal
2.	Ms. Anindita Sarkar	Dr. Priyanka Shinde
3.	Ms. K. Vijaya Lakshmi	Dr. Anoop Rawat
4.	Mr. Bappaditya Chandra	Dr. Nikhil Sangith
5.	Ms. Deepshikha	Dr. Manish Shandilya
6.	Mr. Sanat Ghosh	Dr. Shreetama Karmakar
7.	Mr. Samsuzzoha Mondal	
8.	Mr. Palas Roy	
9.	Ms. Ankita Das	
10.	Ms. Ananya Rakshit	
11.	Mr. Baljeet Singh	

12.	Mr. Rustam Singh	
13.	Ms. Anju Yadav	
14.	Ms. Shrabasti Bhattacharya	
15.	Ms. Sayani Das	
16.	Mr. Mahek Dhiman	
17.	Ms. Viola D'Mello	
18.	Mr. Barun K. Maity	
19.	Ms. Imon Mondal	
20.	Ms. Charu Seth	
21.	Ms. Yukti Arora	
22.	Mr. Mandar Bopardikar	
23.	Ms. Simli Dey	
24.	Ms. Mona Gupta	
25.	Mr. Ayan Maity	
26.	Mr. Abhijit Mondal	
27.	Mr. Sanjoy Paul	
28.	Mr. Anustup Chakraborty	
29.	Mr. Amitava Chandra	
30.	Mr. Anirban Das	
31.	Ms. Nita Ghosh	
32.	Mr. Soumyajit Mitra	
33.	Mr. Bijon Sarkar	

	JRFs	SRFs
1.	Mr. Ramiz Sheikh	-
2.	Mr. Joel Cornelio	-
3.	Mr. Mayank Boob	-
4.	Ms. Manisha Yadav	-

b) From other institutions/universities :

None

40. Number of post graduate students getting financial assistance from the university

All the students of DCS are in doctoral programmes, and hence they are all given TIFR fellowships.

41. Was any need assessment exercise undertaken before the development of new

programme(s)? If so, highlight the methodology.

Initiation of any new academic programme is first mooted in the Department, and then a detailed format is presented to the Academic Council for their approval. All the existing programmes in our Department went through this procedure.

42. Does the department obtain feedback from
- faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

The Chemistry Subject Board and the Department periodically discuss the need for new courses and replacement or modification of existing courses. Additionally, the recommendations of the Chemistry Subject Board on the academic requirements of the degrees are ratified by the whole Department and subsequently implemented in the course of studies.

- students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

The Department takes feedback from all students who have taken the classroom courses taught by the faculties in a semester. This feedback is shared anonymously with the instructors with the hope for the betterment of the teaching-learning process.

- alumni and employers on the programmes offered and how does the department utilize the feedback?

No such direct feedback is taken.

43. List the distinguished alumni of the department (maximum 10)

The following table gives the names of some distinguished scientists who have either spent their research career in our department as faculty members or who received their Ph. D. degrees working in our Department, before TIFR became a degree-granting Deemed University.

	Name of the Alumnus	Reason for distinction
1.	Prof. B. Venkatraman	Eminent scientist, educationist and science communicator
2.	Prof. G. Govil	Bhatnagar Awardee, Fellow of INSA and IASc.
3.	Prof. S. Mitra	Bhatnagar Awardee, Fellow of INSA, IASc. and NASc
4.	Prof. K.S.V. Santhanam	Eminent scientist and well-known electrochemist
5.	Dr. R. R. Navalgund	Vikram Sarabhai Distinguished Professor at ISRO, Bangalore and former Director, Space Applications Centre (ISRO)
6.	Dr. Prabuddha Ganguly	Authority on intellectual property rights and a writer
7.	Prof. N. Periasamy	Eminent scientist, Fellow of INSA, IASc. and NASc
8.	Prof. Chanchal Mitra	Eminent scientist at University of Hyderabad
9.	Prof. G. Krishnamoorthy	Eminent scientist, Fellow of INSA
10.	Prof. R. Ramaswamy	Eminent Scientist, Fellow of INSA, IASc and TWAS

44. Give details of student enrichment programmes (special lectures / workshops / seminar) involving external experts.

Our Department has an age-old tradition of holding weekly seminar on Mondays. These talks are given by national and international visitors and departmental members. In addition, seminars on other days are also held for visiting experts. Our students are thus exposed to various aspects of modern scientific research through these talks and interaction with the speakers.

Our students regularly participate in national conferences and workshops, and occasionally in international conferences, by giving talks and presenting posters. They thereby get ample opportunities to extend their knowledge.

In addition, our students also give at least one departmental seminar a year and speak about their research. This way they are trained to present their work, and face positive and negative criticism from the community. Besides, our students are also privileged that they get to hear many internationally and nationally recognized scientists via the Institute level Public Lectures and colloquia.

45. List the teaching methods adopted by the faculty for different programmes.

All classroom teaching courses are one-semester long. Typically, teaching for the Autumn semester starts from the first week of August and ends in the third week of December. Similarly, for the Spring semester, teaching starts from the third

week of January and ends in the last week of May. In addition, a short course is given during July. The teaching style involves writing on the board, and the use of Powerpoint presentations. The evaluation of all courses is based on several assignments and two written examinations. In addition, some instructors ask the students to make short presentation on an assigned topic.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

The Subject Board guidelines ensure that students complete the requirements satisfactorily. Unsuccessful students are given limited number of opportunities to fulfil the requirements; else they are removed from the Institute.

47. Highlight the participation of students and faculty in extension activities.

Several faculty members and students participate in 'out-reach programmes', by giving scientific talks to the public at large (in colleges, rural schools and various other venues); they participate in national and international conferences by presenting their research work; give seminars in national and international institutions. They also participate in TIFR Science Day programme, where various laboratories are made open to school children.

48. Give details of "beyond syllabus scholarly activities" of the department.

DCS conducts and participates in the following activities on a regular basis.

- DCS Seminar
- NSF Colloquium
- VSRP Programme

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

The Academic performance of DCS was reviewed by a panel of international experts in February 2007, set up by the Governing Council of TIFR. This committee made the following observations about the Department of Chemical Sciences:

The Department has done a superb job in building world class instrumentation,

especially in the areas of NMR and various optical spectroscopic techniques. The oral presentations gave testimony to the faculty's authority in using these methods and in appropriately analyzing the data. As a result of the methods developed up to now, the DCS faculty have been highly productive in terms of papers published in recent years, especially given the very small size of almost all the groups. Training the next generation of scientists in these advanced methods is an important contribution of TIFR, as well as having played a leadership role in the development of NMR in India.

In addition, a Review Committee constituted by the UGC, visited TIFR during February 2010, and commented that the deemed to be university status of TIFR offers a unique multidisciplinary environment for carrying out research. The present composition of the faculty members and research facilities at DCS are equally well placed to meet the above description.

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.
- In order to improve the sensitivity and resolution of solid state NMR spectroscopy, several methods have been developed, which are based on homonuclear dipolar decoupling with magic angle spinning frequencies spanning from low to high, unification of heteronuclear spin decoupling schemes, and design of asynchronous schemes. Determination of inter-proton distances in small molecules, identification of unique structural folds in A β peptides upon binding to membranes, elucidating the folding pathway of P2 protein of Plasmodium falciparum and generation of hyperpolarised xenon gas with optical pumping, which could be used for NMR imaging purpose, are some of the important scientific findings.
 - How stable are proteins towards external mechanical forces? To gain insight into that, novel polyproteins have been synthesized using genetic fusion and protein engineering, and unfolding pathways of proteins, their ligand-dependent stability and structure– topology–mechanical stability relationship have been established. In addition, a computational framework for studying the effects of electric fields on proteins has been established. The effect of temporally varying electric field on

amyloid beta structure and dynamics has been reported.

- Computational descriptions of protein flexibility and stability, electronic charge flow across organic molecules within biological and synthetic settings, new algorithms to extract collective functional motions through comparative analysis of protein structures, and a theoretical framework to describe the relationship between the molecular conductance and charge transfer rates across organic molecules have been developed. Computational measures to determine quality of reported protein structures, and new charge transfer transitions in optical absorption spectra of proteins have been identified.
- In order to visualize locations of biologically essential metal ions and lipids in cells several sensors have been developed. These sensors, which are based on their fluorescence properties, will find applications in imaging. A zebrafish larval model for manganese induced Parkinsonism has been developed.
- A novel combination of spectroscopies was used in the study of amyloid-beta peptide oligomers to throw light on the origin of Alzheimer's disease.
- A new facility for carrying out time-resolved absorption spectroscopy and Raman Spectroscopy with 50 femtosecond time resolution has been established. A new paradigm for organic photochemistry in molecular nanocages has been demonstrated. Reaction dynamics of triplet sensitized photoisomerisation of tetra-cis-lycopene and proton-coupled electron transfer reaction have been elucidated.
- 3D structure and dynamics of an unusual Ca^{2+} -binding protein from *E. histolytica* and the effect of Y81F mutation have been studied by NMR spectroscopy, and the liaison between myristoylation and cryptic EF-Hand motif that confers Ca^{2+} sensitivity to neuronal calcium sensor-1 (NCS-1) has been demonstrated. Ribosome binding of the RNA thermometer has been shown to critically regulate the temperature sensing "switches" in MiniROSE RNA functions. The structure of a putative UV inducible protein from *C. reinhardtii* that exhibits RNA and DNA endonuclease activity has been established. Using NMR spectroscopy and replica

exchange molecular dynamics, conformational propensities and dynamics of an intrinsically unstructured $\beta\gamma$ -crystallin from *Hahella chejuensis* have been characterized.

- A pulse sequence (Ile, Thr and Val specific (3, 2)D-CB(CACO)NNH), which accelerates resonance assignment process in proteins significantly, has been proposed. To rapidly collect NMR data and assign the PCSs of CH₃ groups of Ala, Ile, Leu, Met, Thr and Val residues in proteins, a methodology based on (3, 2)D CT-HCCH-COSY experiment has been proposed. The flagella of *Chlamydomonas reinhardtii*, a unicellular green alga, were shown for the first time to weakly align molecules in an external magnetic field, thereby enabling the measurement of various residual dipolar couplings in solution NMR spectroscopy.
- Size and fibre density controlled syntheses of fibrous nanosilica spheres (KCC-1) have been achieved and their applications in CO₂ capture and as supporting materials for metal catalyzed challenging reactions have been demonstrated. Using atomic layer deposition, the high surface area of KCC-1 was coated with TiO₂, which showed extraordinary photo-catalytic activity. Insights into their catalytic mechanism was gained from ¹⁵N and ²⁹Si NMR enhanced by dynamic nuclear polarisation. A new mechanism for the formation of cobalt oxide nano-flowers, wherein sheets slowly evolved with temperature to give rise to the flowers, has been proposed.
- Quenching studies of excited molecules by a stable free radical, when diffusive motion is severely restricted, have shown the detailed dynamics involving photophysical pathways, electron spin-selective magnetic interactions and generation of electron spin polarisation. That such interactions can produce splittings in time-resolved EPR spectra, without any concomitant splittings of their energy levels, has been demonstrated. Novel mechanisms of electron spin-lattice relaxation of organic free radicals with high symmetry, such as anion radicals of C₆H₆, its derivatives and C₆₀ in liquid solutions have been identified. Detailed electron spin-lattice relaxation processes in TEMPO and TEMPOL free radicals in ionic liquids and conventional organic liquids have shown the dynamics to be very similar in these two classes of solvents.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strength: Though ours is a department with a small number of faculty members, the strength lies in their front-line, high-quality research work in excellent laboratories, comparable to the best in the world. The strong points are:

- Excellent faculties trained in world-wide labs. As such the teaching quality is excellent
- Excellent research facilities
- Selection of research scholars is highly competitive
- Students are trained in various compulsory courses and given access to multi-disciplinary research
- Excellent infrastructure support in terms of internet access, library, journals and funding

Weakness: Since our department consists of a small number of faculty members, not all conventional areas of chemistry are adequately covered. Moreover we are limited to not being able to accept/admit a large number of students and as such the breadth of courses are not as broad as should be ideal. Limited availability of laboratory space severely restricts the progress of several research programs.

Opportunities:

- Opportunities to participate in international conferences, to interact with scientists at the international levels as often as necessary to gain visibility.
- Because of the close-knit structure of TIFR, several opportunities to do interdisciplinary research.
- Opportunities to expand the knowledge base of students – it is very convenient to attend lectures in disciplines other than chemistry on a regular basis by renowned researchers/teachers.

Challenges:

- Raising resources like space, students (man-power) and funding.
- Recruiting new faculty members to strengthen the ongoing activities as well as explore new areas of research.
- Modest infrastructure strongly limits broadening of the research activity whereas the research groups have to compete at the international level.
- Popularizing these research fields at the undergraduate level and make the younger generation attracted to these fields within India.
- Interference in day to day administration by the extended bureaucracy, too many rules and not much freedom in execution.

52. Future plans of the department.

The department at TIFR is continuously evolving and hiring new faculty with impressive research credentials who work in areas not considered to be “common or routine”. The future plans of the department are to continue this trend so as to increase the teaching/research skill set of the faculty. We would also like to determine new routes to increase the intake of our Ph.D. students. Currently we are limited by accommodation issues, however efforts are underway to overcome such limitations. In addition, the department is constantly increasing its coursework and efforts are ongoing to develop new, exciting courses that can invigorate the M.Sc./Ph.D. programmes at TIFR.