Catalysis Research in India as seen from Web of Science Data Base

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The publications of Indian scientists in 7 leading specialized Catalysis journals have been analyzed with respect to the affiliation of the contributors. The names of the authors who have contributed maximum number of publications in each of these journals are also listed. It has been shown that catalysis research in India is being mostly pursued in National laboratories, especially National Chemical Laboratory, Pune and Indian Institute of Chemical Technology, Hyderabad. The academic institutions are not even giving a supporting role to this research activity in India since their contribution is very small.

We have been frequently debating the viability of the Bulletin of the Catalysis Society of India at various stages. We may recollect that there have been various arguments for and against. One of these arguments is that there is not enough research output in this country to warrant the publication of the Bulletin of the Catalysis Society of India(BCSI). However, it has been at various stages shown that there is considerable research activity in this area and hence the Catalysis Society of India can sustain a Bulletin of its own. In order to establish this point we have made a search with Catalysis and India as search terms in the web of Sciences for the period 1993 to 2004 (nearly 10 years) and we got 1254 publications which carry the word catalysis in their titles and also originated from India, thus establishing that India is publishing nearly 120 papers per year which carry in their title the word Catalysis.

However we felt that it may be better to search some specialized journals like Journal of Catalysis, Journal of Molecular Catalysis A: Chemical, Applied Catalysis A and B,Catalysis Communications, Catalysis today and Reaction Kinetics and Catalysis Letters for the same period. The data generated are given in Tables 1-7.

There are some observations that can be made.

In these specialized journals National Chemical Laboratory is the leader and especially in the Journal of Catalysis their contribution is more than 50% which is an indication of the choice of journals by the scientists of National Chemical Laboratory.

Indian Institute of Chemical Technology, Hyderabad is a close second in the case of Applied Catalysis and Journal of Molecular Catalysis, though they are behind NCL in the publication in Journal of Catalysis, in spite of the fact that they still retain their second position with nearly 11% contribution of Indian publications in this journal.

National laboratories and research laboratories seem to be very active in this area as compared to the academic institutions in India. This is an indication that in our academic curriculum or in the academic institutions, this area is not vigorously pursued. This aspect requires some careful comparison with academic institutions in other countries and we shall deal with this aspect in a subsequent presentation.

Research in the area of catalysis is pursued only in a few select national and academic institutions in this country. All the publications arising from these

Table.1. Data of the distribution of publications in the **Journal of Catalysis** for the period 1993-2004. (Total = 137) Data collected on 17th December 2004

Institution	Number	Percentage
National Chemical Laboratory, Pune	77	56.2
Indian Institute of Chemical Technology, Hyderabad	15	10.9
Bhabha Atomic Research centre, Mumbai	8	5.8
Central Salt & Marine Chemicals Res.Institute, Bhavnagar	5	3.6
Indian Institute of Technology, Kanpur	4	2.9
Indian Institute of Technology, Kharagpur	4	2.9
Indian Petrochemical Corporation, Baroda	4	2.9
Imperial chemical Industries	3	2.2
Saha Institute of Nuclear Physics, Kolkatta	2	1.5
Hindusthan Lever Limited	2	1.5
Indian Institute of Technology, Bombay	2	1.5
Indian Institute of Technology, Madras	2	1.5
Anna University, Chennai	2	1.5
Indian Institute of Science, Bangalore	2	1.5
Indian Institute of Petroleum	1	0.7
University Institute of Chemical Technology, Mumbai	3	2.2
University of Indore	1	0.7

Table.2. Data of the distribution of publications in the **Journal of Molecular Catalysis A: Chemical** for the period 1993-2004. (Total = 348)
Data collected on 17th December 2004.

Institution	Number	Percentage
National Chemical Laboratory, Pune	93	26.7
Indian Institute of Chemical Technology, Hyderabad	46	13.2
Central Salt & Marine Chemicals Res.Institute, Bhavnagar	25	7.2
M S University Baroda	20	5.7
Anna University	15	4.3
Indian Institute of Petroleum	13	3.7
Indian Institutes of Technology,	44	12.6
Indian Petrochemical Corporation, Baroda	11	3.2
Central Mechanical Engineering Res.Inst	8	2.3
Cochin University of Science and Technology	8	2.3

Table.3. The distribution of Indian publications in **Applied Catalysis A General** for the period 1993-2004. (Total =265) Data collected on 17th December 2004.

Institution	Number	Percentage
National Chemical Laboratory, Pune	72	27.1
Indian Institute of Chemical Technology, Hyderabad	65	24.5
Anna University, Chennai	20	7.5
University Institute of Chemical Technology, Mumbai	12	4.5
Indian Institute of Technology, Madras	11	4.2
Regional Research Institute, Bhubaneswar	11	4.2
Indian Petrochemical Corporation, Baroda	10	3.8
Indian Institute of Petroleum, Dehradun	10	3.8
Indian Institute of Technology, Bombay	9	3.4
Indian Institute of Technology, Kanpur	7	2.6
Cochin University of Science and Technology, Cochin	7	2.6
Indian Institute of Science, Bangalore	4	1.5
Central Salt & Marine Chemicals Res.Institute, Bhavnagar	3	1.1
Bhabha Atomic Research centre, Mumbai	3	1.1
Indian Institute of Technology, Roorkee	3	1.1
University of Madras	2	0.75
University of Bombay	2	0.75
Central Fuel Research Institute, Dhanbad	2	0.75
Madurai Kamaraj University	2	0.75
University of Goa	2	0.75
Central Electrochemical Research Institute, Karaikudi	1	0.38
Indian Association for the Cultivation of Science, Kolkatta	1	0.38
Indian Institute of Technology, Kharagpur	1	0.38
Central Leather Research Institute, Chennai	1	0.38
Gauhati University	1	0.38
Sardar Vallabai Patel University,	1	0.38
Hindusthan Lever Limited	1	0.38
Bharat Heavy Electricals Limited	1	0.38

Table.4 Institution wise distribution for the contribution from Indian scientists to **Applied Catalysis B Environmental** (total = 24 documents for the period 1993-2004)

Name of the Institute	No	%
Indian Institute of Chemical Technology, Hyderabad	7	29.2
Indian Institutes of Technology	5	20.8
Indian Institute of Science	3	12.5
Bhabha Atomic Research Centre	2	8.3
National Environmental Engineering research Institute	2	8.3
University of Bombay	2	8.3

Table.5. Distribution of Publications in **Catalysis Communications** by Indian authors (total documents =58) Data on 18th December 2004.

Institution	Number	Percentage
National Chemical Laboratory	24	41.4
Indian Institute of Chemical Technology, Hyderabad	21	36.2
Indian Institutes of Technology (IITB,K,M, and R)	6	10.3
7 other institutions each contributing one publication	7	12.1

Table 6 Distribution of contributions from India in Catalysis Today total documents =51 and analysis date is 18th December 2004.

Institution	Number	Percentage
National Chemical Laboratory, Pune	28	54.9
Indian Institutes of Technology	9	17.6
Indian Institute of Chemical Technology, Hyderabad	4	7.8
Cochin University of Science and Technology	2	3.9
Indian Institute of Petroleum	2	3.9
University of Mumbai	2	3.9

Table 7 Distribution of contributions from India in **Reaction Kinetics and Catalysis Letters**, total documents =151 and analysis date is 19th December 2004

Name of the Institution	No.	%
Cochin University of Science and Technology,	18	11.
Indian Institutes of Technology	17	11.3
Indian Institute of Chemical Technology	16	10.6
Indian Petrochemical Corporation Limited	15	9.9
National Chemical Laboratory, Pune	13	8.6
Central Salt &Marine Chemicals Res. Institute, Bhavnagar	8	5.3
Anna University	7	4.6
Karnatak University	7	4.6
JNV University	6	4.0
Annamalai University	5	3.3
43 other institutions	39	25.8

Table 8. Contributors with maximum number of papers in **Journal of Catalysis** in the 137 documents scanned

Name of the author	Number	Percentage
Choudhary VR	22	16.1
Ratnasamy P	13	9.5
Kumar R	10	7.3
Srinivas D	9	6.6
Gupta NM	8	5.8
Ramaswamy AV	8	5.8
Sivasanker S	8	5.8

Table 9.List of authors with maximum publications in **Journal of Molecular Catalysis A Chemical** (Total document scanned = 348)

Name of the author	Number	Percentage
Choudhary B M	16	4.6
Halligudi SB	15	4.3
Sivasanker S	15	4.3
Kantam ML	14	4.0
Kureshy RI	14	4.0
Singh AP	14	4.0
Abidi SHR	13	3.7
Khan NH	12	3.4
Chaudhari RV	11	3.2
Ram RN	10	2.9

Table.10. Contributors with maximum contributions and percentage share in **Applied Catalysis A General** in the 265 documents scanned

Name of the author	No	%
Narayanan S	19	7.2
Choudhary VR	16	6.0
Rao BS	13	4.9
Rao PK	13	4.9
Singh AP	11	4.2
Subrahmanyam M	11	4.2
Ramaswamy AV	10	3.8
Kulkarni SJ	9	3.4
Rao KSR	9	3.4
Halgeri AB	8	3.0

Table.11. Contributions to **Applied catalysis B Environmental**, (Total documents scanned = 27)

Name of the author	No	Percentage
Subrahmanyam M	6	25.0
Madras G	3	12.5
Selvam P	3	12.5
Sivalingam G	3	12.5
Kannan S	2	8.3
Labhsetwar, NK	2	8.3
Mohapatra SK	2	8.3

so far published has also been analyzed and it can be seen once again only NCL, Pune and IICT, Hyderabad are on the top both together contributing more than 75% of all publications resulting from India.

Table 12. Top Contributors in **Catalysis Communications** in the 58 documents scanned

Name of the author	Number	Percentage
Anand R	5	8.6
Choudhary VR	5	8.6
Dongare MK	5	8.6
Rao KSR	5	8.6
Rao PK	5	8.6
Chary KVR	4	6.9
Raghavan KV	4	6.9

Table .13.Top Contributors in **Catalysis Today** in the 51 documents scanned

Name of the author	No	Percentage
Chaudhari RV	10	19.6
Ramaswamy AV	4	7.8
Selvam P	4	7.8
Hegde SG	3	5.9
Vetrivel R	3	5.9

Table 14. Maximum contributors to the Reaction Kinetics and Catalysis Letters from 151 documents scanned

Name of the author	No.	%
Suganan	13	8.6
Halligudi SB	7	4.6
Nandibeweoor ST	7	4.6
Banerjee KK	6	4.0
Swamy CS	6	4.0
Tembe GL	6	4.0
Subrahmanyam M	5	3.3
Ganeshpure PA	4	2.6
Karunakaran C	4	2.6
Kumari VD	4	2.6

The striking point from all these data is that these two national laboratories are not only leaders in publications in this area, they seem to be carrying out research in various aspects in this area since there are a variety of groups from each of these institutions.

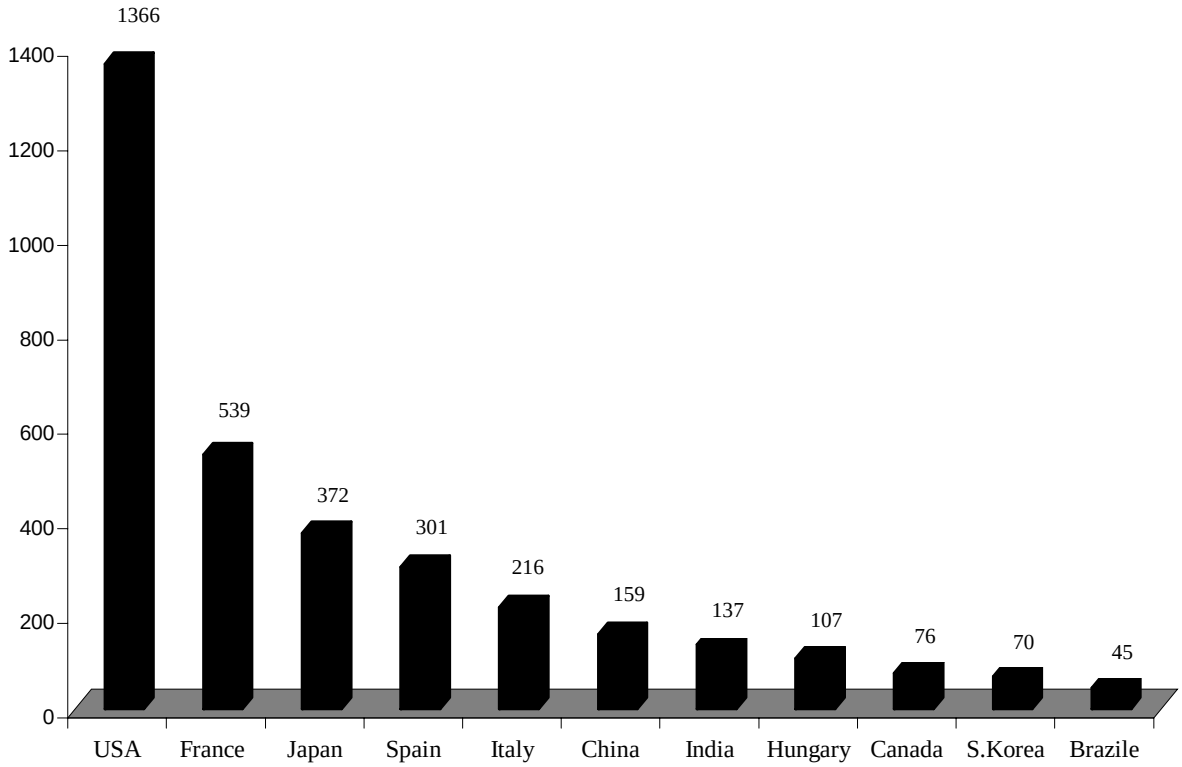

Fig.1. The distribution of the contributions of various countries to the Journal of Catalysis for the period 1993-2004.

We also counted the citations to a selected 39 papers of Indian origin published in Journal of molecular catalysis A Chemical and the total citations so far received for these 39 papers is 350 which clearly shows that these papers have been receiving considerable attention among the scientific community.

We have also tabulated the authors who have published maximum number of papers in each of these journals and the corresponding data are presented in Tables.8-14 It can be seen that about 8 of them appear in 2 or 3 journals in the list of maximum contributors to these journals from India. This reflects also on the strength of these groups and their consistent research activity. It should be remarked that papers in the field of catalysis from India are also published in various other journals like chemical communications, Indian journal of Chemistry A and B and so on. This presentation has not considered these contributions for this analysis. The data on the total number of articles with catalysis search term for various countries are given in Fig.2. These data were collected in order to assess the extent of contribution of Indian Scientists to the field of Catalysis as seen by the whole web of science data base.

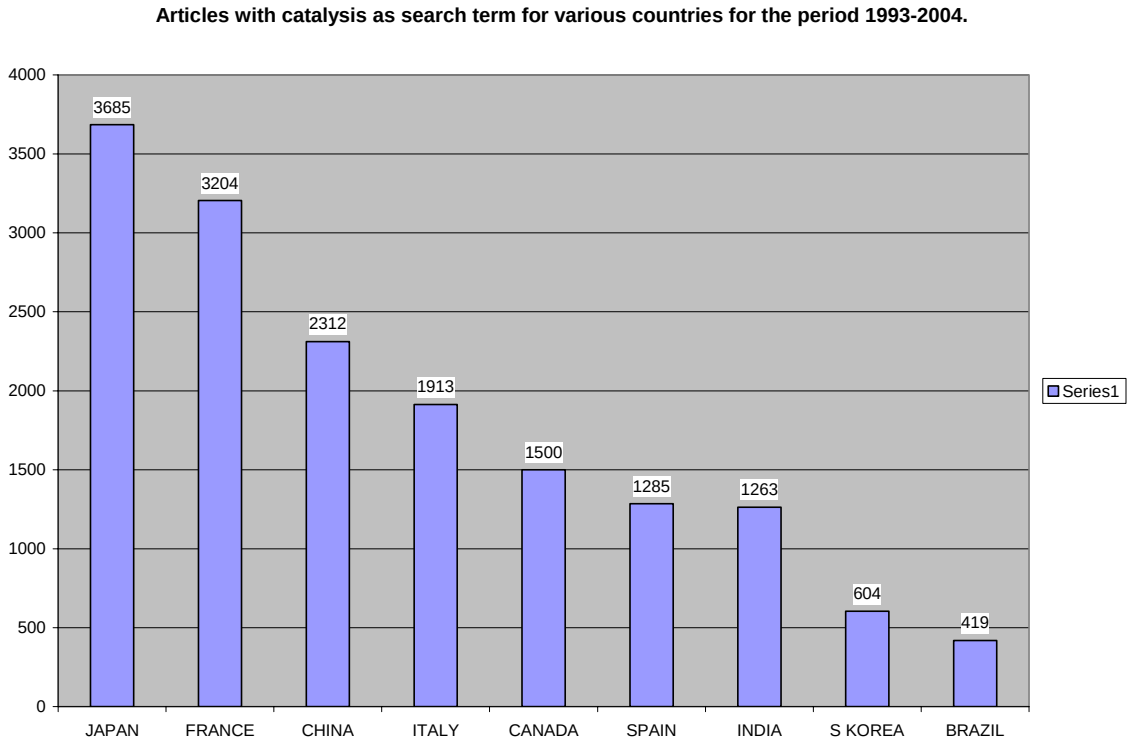

Fig.2. Distribution of number of papers with catalysis as search term for various countries for the period 1993-2004.

The data shown in Fig.2 indicate that India's contribution to the scientific literature with search term catalysis is comparable to most of the other countries like Spain, Canada and even China is not very far ahead of country. This figure in a way (though not truly!) reflects the contribution to the field of catalysis by Indian scientists covering all other journals other than the 7 we have considered in this presentation. It is heartening to note that there are enough scientific articles generated by Indian scientists in this field.

The question is still do we have doubts over the feasibility of good quality of a Bulletin of Catalysis Society of India?