

## PROJECT ADMINISTRATION DATA SHEET



ORIGINAL



REVISION NO. \_\_\_\_\_

Project No. E-19-657DATE 6/17/82Project Director: Dr. Pradeep K. AgrawalSchool/Dept XXX Chemical EngineeringSponsor: American Chemical Society; 1155 16th Street, N.W., Washington, D.C. 20036Type Agreement: Grant No. PRF #13755-67Award Period: From 6/1/82 To 8/31/84 (Performance) \_\_\_\_\_ (Reports) \_\_\_\_\_Sponsor Amount: \$10,000 Contracted through: \_\_\_\_\_Cost Sharing: \$9,000 (E-19-325) GTRI/~~XXX~~Title: TPR/TPD Studies of Alkali-Promoting Effects on Fischer Tropsch Catalysts

## ADMINISTRATIVE DATA

OCA Contact Linda H. Bowman x-4820

## 1) Sponsor Technical Contact:

## 2) Sponsor Admin/Contractual Matters:

Joseph E. Rogers, Jr.Program AdministratorAmerican Chemical Society1155 - 16th Street, N.W.Washington, D. C. 20036Phone: (202) 872-4481Defense Priority Rating: NoneSecurity Classification: None

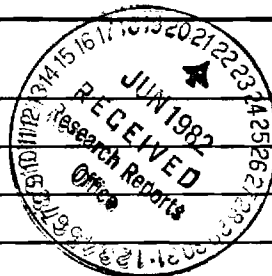
## RESTRICTIONS

See Attached N/A Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval - Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of \$500 or 125% of approved proposal budget category.

Equipment: Title vests with N/A

## COMMENTS:



## COPIES TO:

Research Admin. Network  
Research Property Management  
Accounting  
Procurement/EES Supply Services  
FORM OCA 4-781Research Security Services  
Reports Coordinator (OCA) ✓  
Legal Services (OCA)  
LibraryEES Public Relations (2)  
Computer Input  
Project File  
Other GTRI

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

2-11 SR-523

Date 7-13-87

Project No. E-19-657 School/Dept XXX ChE

Includes Subproject No.(s) N/A

Project Director(s) Dr. Pradeep K. Agrawal GTRC / XXX

Sponsor American Chemical Society; 1155 16th Street, N.W., Washington, D.C. 20036

Title TPR/TPD Studies of Alkali-Promoting Effects on Fischer Tropsch Catalysts

Effective Completion Date: 8/31/84 (Performance) N/A (Reports)

Contract/Contract Closeout Actions Remaining:

- ☒ None
- ☐ Final Invoice or Final Fiscal Report
- ☐ Closing Documents
- ☐ Final Report of Inventions
- ☐ Govt. Property Inventory & Related Certificate
- ☐ Classified Material Certificate
- ☐ Other \_\_\_\_\_

Continues Project No. \_\_\_\_\_ Continued by Project No. \_\_\_\_\_

COPIES TO:

- |                                  |                                      |
|----------------------------------|--------------------------------------|
| Project Director                 | Library                              |
| Research Administrative Network  | GTRC                                 |
| Research Property Management     | Research Communications (2) <u>X</u> |
| Accounting                       | Project File                         |
| Procurement/GTRI Supply Services | Other <u>Duane H.</u>                |
| Research Security Services       | Angela DuBose                        |
| Reports Coordinator (OCA)        | Russ Embry                           |
| <del>Legal Services</del>        |                                      |

E-19-657

# Georgia Institute of Technology

A UNIT OF THE UNIVERSITY SYSTEM OF GEORGIA

ATLANTA, GEORGIA 30332

SCHOOL OF  
CHEMICAL ENGINEERING  
(404) 894-2826

E-19-657

September 30, 1983

Dr. Joseph B. Rogers, Jr.  
Program Administrator  
The Petroleum Research Fund  
American Chemical Society  
1155 Sixteenth Street, NW  
Washington, DC 20036

Dear Dr. Rogers:

Please find enclosed one original and two photocopies of the Annual Progress Report on the project, "TPR/TPD Study of Alkali-Promoting Effects on Fischer-Tropsch Catalysts", funded by the Grant - PRF # 13755-G7. A financial summary is enclosed at the end. Please call me at 404-894-2826 if I can be of any assistance.

Best regards.

Sincerely,

Pradeep K. Agrawal  
Assistant Professor

PKA:psh  
Enclosure

THE PETROLEUM RESEARCH FUND

REPORT ON ACTIVITY ASSISTED BY

GRANT, PRF # 13755-G7

Page 1 of 1 pages.

PREPARED BY

Pradeep K. Agrawal

Date September 29, 1983

Please refer to instructions.

Fill in information requested  
above for each page.

The report heading, narrative,  
and all drawings must be prepared  
within the box.

Please submit one sharp, clear  
"original" and a copy (Xerox,  
carbon, etc.) for each page.

13755-G7 TPR/TPD Study of Alkali-  
Promoting Effects on Fischer-Tropsch  
Catalysts

Pradeep K. Agrawal, Georgia Institute of  
Technology

Fe/SiO<sub>2</sub> and Ni/SiO<sub>2</sub> catalysts have been prepared by aqueous impregnation of fumed silica support. The catalysts were prepared in a manner so as to allow an estimate of the alkali promoter present on the SiO<sub>2</sub> support and that present on the metal crystallites. The "true" atomic ratio of K/metal can be varied over a wide range by using adequate preparation variables. Also, the catalytic metal is poorly dispersed so that the effect of alkali promoter present on SiO<sub>2</sub> can be ignored, and only the effect of that present on the metal crystallite need be considered.

Preliminary results using TPR and TPD show the primary effect of alkali promoter to be on increasing the metal-carbon bond strength rather than decreasing the adsorption of H<sub>2</sub>. The carbon adatoms on unpromoted Fe catalysts are readily hydrogenated to form CH<sub>4</sub> at room-temperature, whereas no traces of CH<sub>4</sub> are observed over promoted Fe catalysts. The TPD results indicate the evidence of a small decrease in H<sub>2</sub> adsorption, hence the decrease in methanation activity appears to be related to increased metal-carbon bonding. The CO dissociates almost completely on Fe catalysts, and no CO desorption is observed during subsequent TPD experiments. However, the oxygen is readily hydrogenated to form water at room-temperature on both promoted and unpromoted catalysts. On Ni/SiO<sub>2</sub> catalysts only small quantities of CO<sub>2</sub> are formed during TPD experiments, and most of the CO comes off during TPD experiments. This indicates that a large fraction of CO does not dissociate on Ni/SiO<sub>2</sub> catalysts.

PERSONNEL STATEMENT

PRF# 13755-G7 REPORTING PERIOD June 1, 1982 TO August 31, 1983  
GRANTEE INSTITUTION Georgia Institute of Technology DEPARTMENT Chemical Engineering  
PRINCIPAL INVESTIGATOR(S) Pradeep K. Agrawal, Assistant Professor  
GRANT PROJECT TITLE "TPR/TPD Study of Alkali-Promoting Effects on Fischer-Tropsch Catalysts"

List undergraduate, graduate, and postdoctoral co-workers receiving stipends under the above named grant:

NAME	TITLE OR ACADEMIC APPOINTMENT	PREVIOUS EDUCATION & DEGREES*	COUNTRY OF PERMANENT RESIDENCE	PERIOD OF SUPPORT (MONTHS)	PERCENT OF SUPPORT FROM PRF **	DEGREES RECEIVED (IF ANY) DURING REPORTING PERIOD
Mr. John Kostas, Graduate	Graduate Asst.	B.Ch.E., U. of Delaware	U.S.A.	----	None	None
Student						

List other co-workers on grant project not directly supported with ACS - PRF funds:

NAME	SOURCE OF SUPPORT	DATES ASSOCIATED WITH GRANT PROJECT

\* For graduate students, indicate the College or University attended prior to graduate work. For postdoctoral fellows, give the name of the Ph. D. granting institution.

\*\* (during the period stated in preceding column)

Revised 6/82

GEORGIA INSTITUTE OF TECHNOLOGY  
ATLANTA, GEORGIA 30332

ASSOCIATE VICE PRESIDENT  
(FINANCE)

GRANTS AND CONTRACTS  
ACCOUNTING DEPT.

(404) 894-4624 OR 2629



September 19, 1983

The Petroleum Research Fund  
American Chemical Society  
1155 Sixteenth Street, N.W.  
Washington, D.C. 20036

Gentlemen:

Enclosed in duplicate is the Annual Financial Statement for PRF  
No. 13755-67 for the year ended August 31, 1983.

If you have any questions or require any additional information,  
please contact this office at (404) 894-4624.

Sincerely,

Sybil P. Small, Assistant Manager  
Grants and Contracts Accounting

SPS/LAG/vdh

Enclosures

cc: Dr. G.W. Poehlein  
Dr. P.K. Agrawal ✓  
Mr. D.S. Hasty  
File E-19-657 (R5494-OAO)

## AMERICAN CHEMICAL SOCIETY - THE PETROLEUM RESEARCH FUND

For the Period: June 1, 1982 to August 31, 1983  
(The preferred closing date for the reporting period is August 31.)

Balance Carried Over from Previous Reporting  
Period (from Same or Earlier Grant)

\$ - 0 -

Received from PRF During Report Period  
(Include Supplements)

8,000.00

Stipends to:

a. Principal Investigator . . . . . \$ 2,500.02

(Contribution Toward Summer Salary\*)

b. Undergraduate Students . . . . .

c. Graduate Students . . . . .

d. Postdoctoral Fellows . . . . .

e. Summer Research Fellows (Only if  
funded by Summer Research Supplement)

Faculty ☐ Student ☐ (check one)

f. Other (Specify) Fringe Benefits . . . . . 531.09

Tuition . . . . .

Materials and Supplies . . . . . 4,968.89

Equipment . . . . .

Computer Time Charges . . . . .

Travel (Explain if in excess of budget) . . . . .

Other Expenses (Attach itemized list) . . . . .

Departmental Allocation\* . . . . .

\*If provided in grant agreement

Total Expenditures During Reporting Period . . . \$ 8,000.00

Balance on Hand at End of Period

- 0 -

Total of PRF Grant Payments Received to Date

\$ 8,000.00

Complete this section only for a FINANCIAL STATEMENT which shows a balance in the grant account at the termination date of the current grant agreement.

The balance in the grant account will be liquidated:

☐ By refund of unspent and uncommitted funds. The check should be drawn to the order of American Chemical Society - The Petroleum Research Fund, and identified by the number of the grant.

☒ By use in the completion of the grant project. We hereby request approval by the American Chemical Society of an extension of the grant agreement, without commitment of additional funds, until August 31, 1984 (Period up to one year, renewable).

We certify that the expenditures reported herein were incurred for education and research in accordance with the terms of the approved ACS-PRF grant-in-aid.

Georgia Tech Research Institute

(Grantee Institution)

Sybil P. Small

Financial Officer (typed name) (Signature)

(404) 894-4624

(Telephone)

September 19, 1983

(Date)

Dr. PRADEEP K. Agrawal

Name of Principal Investigator

PRF #13755-67

PRF Number

Please submit to The Petroleum Research Fund, American Chemical Society  
1155 Sixteenth Street, N.W., Washington, D.C. 20036 Telephone (202) 872-4461

THE PETROLEUM RESEARCH FUND

REPORT ON ACTIVITY ASSISTED BY

GRANT, PRF # 13755-G7

Page 1 of 1 pages.

PREPARED BY

Pradeep K. Agrawal

Date August 30, 1984

Please refer to instructions.

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and all drawings must be prepared  
within the box.

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carbon, etc.) for each page.

G&A SEP 4 '84

13755-G7 TPR/TPD Study of Alkali-

Promoting Effects on Fischer-Tropsch  
Catalysts

Pradeep K. Agrawal, Georgia Institute of  
Technology

Alkali promoted Ni/SiO<sub>2</sub> catalysts  
have been prepared by aqueous impregnation  
of the SiO<sub>2</sub> support in such a manner so as  
to distinguish the alkali promoter present  
on the Ni crystallites. Also, the Ni metal  
was poorly dispersed so that the effects  
of the alkali promoter present on the SiO<sub>2</sub>  
can be neglected as compared to that pre-  
sent on the metal crystallites.

Results of TPD show the primary effect  
of the alkali promoter to be on increasing  
the metal-carbon bond strength and on  
increasing the probability of dissociative  
chemisorption of CO. A secondary effect  
is a small decrease in the strength of H<sub>2</sub>  
adsorption upon alkali promotion.

Results from TPSR experiments show  
that surface carbon is more readily hydro-  
genated to methane as compared to chemi-  
sorbed CO. On an unpromoted catalyst, the  
activation energy for methanation of ad-  
sorbed CO was found to be 113 KJ/mole,  
whereas the activation energy for methana-  
tion of surface carbon was 37 KJ/mole.

Preliminary results on a 0.1% doped  
catalyst show an increase in the methana-  
tion activation energy of 9 KJ/mole for  
the hydrogenation of chemisorbed CO and an  
increase of 4 KJ/mole for the hydrogenation  
of surface carbon. This appears to be  
related to the increased metal-carbon bond.

*This is the final report on E-19-657  
that Deane gave me today - 3/3/87.  
Sponsor has rec'd all required documents.  
Terminate!*