

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: Sept. 18, 1968

Project Title: Epitaxial Overgrowth Studies

Project No.: B-350

Project Director: Dr. Charles O. Pollard

Sponsor: American Chemical Society, The Petroleum Research Fund

Effective Sept. 1, 1968 Estimated to run until: Aug. 31, 1970

Type Agreement: . . . Grant PRF. #1477-G3 Amount: \$ 5,000*

Reports: Progress and financial reports at the end of
the first year.
Final research and financial report at the end of the
second year.

Contact Person: Mr. Robert E. Henze, Director
Research Grants and Fellowships Division
American Chemical Society
1155 Sixteenth Street, N. W.
Washington, D. C. 20036

*Grant provides funding in the amount of \$2,500 for each of two years.

Assigned to Physical Sciences Division

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REPORTS
200. B-350
EES

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT TERMINATION

Date December 11, 1972

PROJECT TITLE: Epitaxial Overgrowth Studies

PROJECT NO: B-350

PROJECT DIRECTOR: C.O. Pollard

SPONSOR: American Chemical Society

TERMINATION EFFECTIVE: October 12, 1972

CHARGES SHOULD CLEAR ACCOUNTING BY: All charges have cleared

Final Report mailed 10/12/72

PHYSICAL SCIENCES DIVISION

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GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Atlanta, Georgia

PROGRESS REPORT

Project B-350

EPITAXIAL OVERGROWTH STUDIES

by

Charles O. Pollard

Grant PRF 1477-G3



September 1, 1968
to August 31, 1969

Performed for
AMERICAN CHEMICAL SOCIETY
WASHINGTON, D. C. 20036

PROGRESS REPORT

PROJECT B-350

EPITAXIAL OVERGROWTH STUDIES

CHARLES O. POLLARD

Grant PRF 1477-G3

September 1, 1968 to
August 31, 1969

Prepared for
American Chemical Society
Washington, D. C. 20036

BRIEF ANNUAL REPORT

PRF # 1477-G3

TITLE OF GRANT EPITAXIAL OVERGROWTH STUDIES

PRINCIPAL INVESTIGATOR Charles O. Pollard, Jr.

INSTITUTION Georgia Institute of Technology

Initiation of the project was begun late in the report period, so the project was essentially inactive; however, one report (1) was published, one oral paper (2) was read, and one article (3) is being submitted, all covering initial phases of the research.

(1) R. A. Young, C. E. Wagner, C. O. Pollard, and G. Donnay, Evidence from source-image distortion, 1967-1968 Annual Report of the Director, Geophysical Laboratory (Carnegie Institution Year Book 67), 220 (1969).

(2) C. E. Wagner, G. Donnay, C. O. Pollard, Jr. and R. A. Young, Textural variation in colored tourmaline crystals (abstract), Am. Crystallogr. Assoc. Annual Meeting (August 11-16, 1968).

(3) C. E. Wagner, G. Donnay, C. O. Pollard, Jr. and R. A. Young, Textural variation in zoned tourmaline crystals, manuscript in preparation.

FINANCIAL STATEMENT

The annual financial statement was provided earlier (letter to Dr. R. E. Henze on August 19, 1969). The only expenditure was \$75.40 for Materials and Supplies.

ANNUAL PERSONNEL STATEMENT

PRF # 1477-G3

PRINCIPAL INVESTIGATOR C.O. Pollard, Jr. INSTITUTION Georgia Inst. of Technolo

TITLE OF GRANT EPITAXIAL OVERGROWTH STUDIES

UNDERGRADUATE SCHOLARS, PREDOCTORAL FELLOWS
OR ASSISTANTS, AND POSTDOCTORAL FELLOWS
SUPPORTED UNDER ABOVE NAMED ACS-PRF GRANT

NAME	HIGHEST DEGREE HELD	<u>1/</u> UNDERGRADUATE SCHOOL	COUNTRY OF PERMANENT RESIDENCE	<u>2/</u> DEGREE(S) GRANTED	DATES SUPPORT WAS REC'D
NONE					

OTHER PERSONNEL ENGAGED IN RESEARCH
ON GRANT BUT NOT DIRECTLY SUPPORTED
WITH ACS-PRF FUNDS

NAME	SOURCE OF SUPPORT	DATES ASSOCIATED WITH GRANT RESEARCH
NONE		

1/ For graduate students, indicate the name of College or University attended prior to graduate work.

2/ List the degree or degrees obtained while participating in research under PRF sponsorship.

LIST OF PUBLICATIONS ACKNOWLEDGING PRF SUPPORT

PRF # 1477-G3

PRINCIPAL INVESTIGATOR C. O. Pollard, Jr. INSTITUTION Georgia Inst. of Technolo

TITLE OF GRANT Epitaxial Overgrowth Studies

In order to maintain a comprehensive record of all publications acknowledging PRF support we ask each principal investigator to enter the titles and literature references for such publications below. This list will become a part of the record of each grant and will be returned to the principal investigator annually during the term of the grant for appropriate additions and revisions. Please use the format illustrated by the following example.

- | |
|---|
| <p>(1) C. Pierce and B. Ewing, "Physical Adsorption in the Multilayer Region on Heterogeneous and Homogeneous Surfaces", <u>J. Am. Chem. Soc.</u> <u>84</u>, 4070 (1962).</p> |
|---|

No such publications were printed.

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Atlanta, Georgia

PROGRESS REPORT

Project B-350

ORIENTED CRYSTALLINE REACTIONS, INTER-
GROWTHS, AND OVERGROWTHS

by

Charles O. Pollard



Grant PRF 1477-G3

September 1, 1969
to August 31, 1970

Performed for
AMERICAN CHEMICAL SOCIETY
Washington, D. C. 20036

PROGRESS REPORT

PROJECT B-350

ORIENTED CRYSTALLINE REACTIONS, INTER-
GROWTHS, AND OVERGROWTHS

Grant PRF 1477-G3

September 1, 1969
to August 31, 1970

Prepared for
American Chemical Society
Washington, D. C. 20036

BRIEF ANNUAL REPORT

PRF # 1477-G3

TITLE OF GRANT ORIENTED CRYSTALLINE REACTIONS, INTERGROWTHS, AND
OVERGROWTHS

PRINCIPAL INVESTIGATOR Charles O. Pollard, Jr.

INSTITUTION Georgia Institute of Technology

The alteration of some minerals, during weathering or metamorphism, occurs by oriented reactions, such that the alteration product (the guest) is oriented relative to one of the alteration reactants (the host) so particular crystalline directions are parallel in guest and host (topotaxy). Mechanisms that account for the steric adjustments have been proposed for few such alterations.

A mechanism has been described (1,2) for the particular oriented alteration whereby montmorillonite layers are replaced by illite layers (either in bulk or in mixed-layer clays) during diagenesis and early burial metamorphism. The mechanism allows increased Al substitution in the tetrahedral sites. Intralayer stacking rotations in product illite are inherited from reactant montmorillonite layers, depending on the particular Si tetrahedra vacated by Si.

In the preparation of the manuscript (2) reporting the montmorillonite - illite mechanism, an alternative model was developed for sheet-stacking in the 2:1 dioctahedral phyllosilicate structures

fitting each of the polytype classifications that occur naturally ($1M_1$, $2M_1$, $3T$). The $3T$ muscovite structure was chosen as the first example, to test the appropriateness of the alternative model (allowing only intralayer sheet rotations) with respect to the published structure (only interlayer sheet rotations). The published structure was found (3) to fit preferably the particular crystal analysed, if $P3_112$ is the appropriate space group.

(References cited are given in the List of Publications
Acknowledging PRF Support.)

PRF # 1477-G3

Principal
Investigator Charles O. Pollard, Jr.
Georgia Institute
Institution of Technology

ANNUAL FINANCIAL STATEMENT
AMERICAN CHEMICAL SOCIETY -- PETROLEUM RESEARCH FUND GRANT

For the Period: September 1, 1969 - August 31, 1970

(Give dates of period covered by this report - usually
September 1, 19__ to August 31, 19__; or the first period
of the grant which may be more than 12 months and ending
August 31, 19__.)

Salaries:

To Principal Investigator \$1,601.90*
(contribution toward summer salary)

To Others, if any _____

Stipends to Students:

Undergraduates and/or Graduates _____

Postdoctoral Fellows _____

Tuition _____

Materials and Supplies 47.75

Equipment _____

Travel _____

Other Expenses _____

Institutional Supplement* _____

Departmental Supplement* _____

*if provided in grant agreement

Total Expenditures During Reporting Period \$1,649.65

Balance on Hand at End of Period 3,274.95

Total of PRF Grant Payments Rec'd to Date \$5,000.00

Approved _____
Financial Officer

Date _____

ANNUAL PERSONNEL STATEMENT

PRF # 1477-G3

PRINCIPAL INVESTIGATOR C. O. Pollard, Jr. INSTITUTION Georgia Inst. of Technology

TITLE OF GRANT ORIENTED CRYSTALLINE REACTIONS, INTERGROWTHS, AND OVERGROWTHS

UNDERGRADUATE SCHOLARS, PREDOCTORAL FELLOWS
OR ASSISTANTS, AND POSTDOCTORAL FELLOWS
SUPPORTED UNDER ABOVE NAMED ACS-PRF GRANT

NAME	HIGHEST DEGREE HELD	<u>1/</u> UNDERGRADUATE SCHOOL	COUNTRY OF PERMANENT RESIDENCE	<u>2/</u> DEGREE(S) GRANTED	DATES SUPPORT WAS REC'D
None					

OTHER PERSONNEL ENGAGED IN RESEARCH
ON GRANT BUT NOT DIRECTLY SUPPORTED
WITH ACS-PRF FUNDS

NAME	SOURCE OF SUPPORT	DATES ASSOCIATED WITH GRANT RESEARCH
None		

- 1/ For graduate students, indicate the name of College or University attended prior to graduate work.
- 2/ List the degree or degrees obtained while participating in research under PRF sponsorship.

LIST OF PUBLICATIONS ACKNOWLEDGING PRF SUPPORT

PRF # 1477-G3

PRINCIPAL INVESTIGATOR C. O. Pollard, Jr. INSTITUTION Georgia Inst. of Technology

TITLE OF GRANT ORIENTED CRYSTALLINE REACTIONS, INTERGROWTHS, AND OVERGROWTHS

In order to maintain a comprehensive record of all publications acknowledging PRF support we ask each principal investigator to enter the titles and literature references for such publications below. This list will become a part of the record of each grant and will be returned to the principal investigator annually during the term of the grant for appropriate additions and revisions. Please use the format illustrated by the following example.

- (1) C. O. Pollard, Jr., "Semidisplacive Mechanism for Diagenetic Alteration of Montmorillonite to Illite" 82nd Ann. Meetg. Geol. Soc. Amer., Atlantic City (1969)
- (2) C. O. Pollard, Jr., "Semidisplacive Mechanism for Diagenetic Alteration of Montmorillonite Layers to Illite Layers", Manuscript revision in preparation.
- (3) C. O. Pollard, Jr., and L. D. Pollard, "Polytypism in 2:1 Dioctahedral Phyllosilicates: Interlayer and Intralayer Rotations", 7th Ann. Meetg. Clay Min. Soc., Miami Beach (1970).

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Atlanta, Georgia

PROGRESS REPORT

Project B-350

ORIENTED CRYSTALLINE REACTIONS, INTER-
GROWTHS, AND OVERGROWTHS

by

Charles O. Pollard



Grant PRF 1477-G3

September 1, 1970
to August 31, 1971.

Performed for
AMERICAN CHEMICAL SOCIETY
Washington, D. C. 20036

PROGRESS REPORT

PROJECT B-350

ORIENTED CRYSTALLINE REACTIONS, INTER-
GROWTHS, AND OVERGROWTHS

Grant PRF 1477-G3

September 1, 1970
to August 31, 1971

Prepared for
American Chemical Society
Washington, D. C. 20036

BRIEF ANNUAL REPORT

PRF # 1477-G3

TITLE OF GRANT ORIENTED CRYSTALLINE REACTIONS, INTERGROWTHS, AND
OVERGROWTHS

PRINCIPAL INVESTIGATOR Charles O. Pollard, Jr.

INSTITUTION Georgia Institute of Technology

In a study of oriented crystalline (topotactic) reactions, a model was developed (1) for alteration of single montmorillonite layers to illite layers. The montmorillonite-to-illite alteration is of profound importance during diagenesis of mudstones and shales. As the alteration model (1) was developed, previously undescribed possible sequences of sheet-stacking in 2:1 dioctahedral phyllosilicates became obvious; however, at least for one crystal (3T muscovite), the previously accepted sheet-stacking sequence was proven correct (2).

Other topotactic alterations were sought in a scanning electron microscopic study of weathering in pseudomorphs after pyrite (3). Microvugs, intergranular voids, and lack of orientation in fibrous grains attested to poor control by the host pyrite crystal on orientation of guest crystals.

A form of oriented crystalline overgrowth and intergrowth under study is zoning in natural crystals. In growth-and sector-zoned crystals of tourmaline, the following findings were discovered (4): a) sector-zoning (chemical differences established among crystalline volumes created by growth on different faces, within otherwise single crystals) may occur in tourmaline by growth of one composition on the three faces (11.0), ($1\bar{2}.0$), and ($\bar{2}1.0$) and another composition on ($\bar{1}\bar{1}.0$), ($\bar{1}2.0$), and ($2\bar{1}.0$); b) no sector-zoning occurs between those sectors behind the second-order

prism faces listed in a) and neighboring sectors behind the first-order prism faces [with Miller-Bravais indices of (10.0) and appropriate permutations]; c) most, but not all, the sector-zone boundaries involve concentrations of dislocation-type faults with Burgers vectors aligned perpendicular to the boundaries; d) rare misorientations of lattices across sector-zone boundaries are on the order of 40 seconds of arc, involving rotations about axes normal to the boundaries; and e) additional poorly-characterized misorientations occur, involving rotations of about 15 seconds of arc around axes parallel to [00.1].

(References cited are given in the List of Publications Acknowledging PRF Support.)

ANNUAL FINANCIAL STATEMENT

AMERICAN CHEMICAL SOCIETY - THE PETROLEUM RESEARCH FUND

For the Period: September 1, 1970 to August 31, 1971
(Give dates of period covered by this report - usually
September 1, 19__ to August 31, 19__; except for the
first period of the grant which may be more than 12
months ending August 31, 19__.)

Balance at Start of Reporting Period 3,197.35

Received from PRF During Reporting Period -0-

Salaries to:

Principal Investigator 1,092.47
(Contribution toward summer salary)

Graduate or Undergraduate Students 868.10

Postdoctoral Fellows -

Fellowships or Scholarships to:

Undergraduate Scholars -

Graduate Fellows -

Postdoctoral Fellows -

Tuition -

Materials and Supplies -7.05*

Equipment -

Travel 285.11

Other Expenses -

Institutional Supplement* -

Departmental Supplement* -

*(If provided in grant agreement)

Total Expenditures During Reporting Period 2,238.63

Balance on Hand at End of Period 958.72

Total of PRF Grant Payments Received to Date _____

Approved _____

(Financial Officer's Signature)

9-18-71
(Date)

(Institution)

(Name of Principal Investigator)

PRF No. _____

*Negative expenditure is apparent, because of differences between expected costs and actual costs of items bought near beginning of reporting period.

ANNUAL PERSONNEL STATEMENT

PRF # 1477-G3 REPORTING PERIOD September 1, 1970 TO August 31, 1971

PRINCIPAL INVESTIGATOR C. O. Pollard INSTITUTION Georgia Institute of Technology

TITLE OF GRANT Oriented Crystalline Reactions, Intergrowths, and Overgrowths

UNDERGRADUATE SCHOLARS, PREDOCTORAL FELLOWS OR ASSISTANTS, AND
POSTDOCTORAL FELLOWS RECEIVING STIPENDS UNDER ABOVE NAMED GRANT

NAME	TITLE, OR ACADEMIC APPOINTMENT	PREVIOUS EDUCATION & DEGREES ¹	COUNTRY OF PERMANENT RESIDENCE	FRACTION OF INDIVIDUAL'S TOTAL SUPPORT FROM PRF (IN REPORTING PERIOD)	DEGREES RECEIVED (IF ANY, DURING REPORTING PERIOD)
Uday R. Bhate	G.R.A.	B.A. University of Bombay	India	One-sixth time	None
J.M. Dornish	G.R.A.	B.A. Rollins College	U.S.	One-sixth time	None

OTHER PERSONNEL ENGAGED IN RESEARCH ON GRANT BUT
NOT DIRECTLY SUPPORTED WITH ACS-PRF FUNDS

NAME	SOURCE OF SUPPORT	DATES ASSOCIATED WITH GRANT RESEARCH
None		

¹ For graduate students, indicate the name of College or University attended prior to graduate work; for post-doctoral fellows give the name of the Ph.D. granting institution.

LIST OF PUBLICATIONS ACKNOWLEDGING PRF SUPPORT

PRF # 1477-G3

PRINCIPAL INVESTIGATOR C. O. Pollard INSTITUTION Georgia Institute of Tech

TITLE OF GRANT Oriented Crystalline Reactions, Intergrowths, and Overgrowths

In order to maintain a comprehensive record of all publications acknowledging PRF support we ask each principal investigator to enter the titles and literature references for such publications below. This list will become a part of the record of each grant and will be returned to the principal investigator annually during the term of the grant for appropriate additions and revisions. Please use the format illustrated by the following example:

- (1) C. Pierce and B. Ewing, "Physical Adsorption in the Multilayer Region on Heterogeneous and Homogeneous Surfaces", J. Am. Chem. Soc. 84, 4070 (1962).
- (1) C. O. Pollard, Jr., "Semidisplacive mechanism for diagenetic alteration of montmorillonite layers to illite layers" (in press), Appendix to Geol. Soc. Amer. Spec. Paper 134, (1971).
- (2) C. O. Pollard, Jr. and L. D. Pollard, "Polytypism in 2:1 dioctahedral phyllosilicates: interlayer and intralayer rotations", Submitted for publication (1971).
- (3) C. O. Pollard, Jr. and L. D. Pollard, "Modes of replacement in a pseudomorph after pyrite (Abstract)", Mineral. Soc. Amer. joint conference with Clay Minerals Soc., Rapid City, S.D. (1971).
- (4) C. O. Pollard, Jr. and C. E. Wagner, "X-ray diffraction topographic and source-image distortion study of sector zoning in a tourmaline crystal (oral, with manuscript to follow)", Amer. Geophys. Union Conference on Petrologic Crystal Chemistry (1971).

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Atlanta, Georgia



FINAL REPORT

Project B-350

ORIENTED CRYSTALLINE REACTIONS, INTER-
GROWTHS, AND OVERGROWTHS

by

Charles O. Pollard

Grant PRF 1477-G3

September 1, 1968
to August 31, 1972

Performed for
AMERICAN CHEMICAL SOCIETY
Washington, D. C. 20036

FINAL REPORT

PROJECT B-350

ORIENTED CRYSTALLINE REACTIONS, INTER-
GROWTHS, AND OVERGROWTHS

Grant PRF 1477-G3

September 1, 1968
to August 31, 1972

Prepared for
American Chemical Society
Washington, D. C. 20036

FINAL REPORT

PRF # 1477-G3

TITLE OF GRANT ORIENTED CRYSTALLINE REACTIONS, INTERGROWTHS, AND
OVERGROWTHS

PRINCIPAL INVESTIGATOR Charles O. Pollard, Jr.

INSTITUTION Georgia Institute of Technology

A model was developed (1) for alteration of single montmorillonite layers to illite layers. The montmorillonite-to-illite alteration is of profound importance during diagenesis of mudstones and shales.

Previously undescribed possible sequences of sheet-stacking in 2:1 dioctahedral phyllosilicates also were developed; however, at least for one crystal (3T muscovite), the accepted sheet-stacking sequence was proven correct (2 and 3).

Scanning electron microscopic studies of pseudomorphs after pyrite (4 and 5) and of silica cement (6 and 7) were also conducted. Microvugs, intergranular voids, and lack of parallelism among fibrous grains attested to poor control by the host pyrite crystal on orientation of guest crystals. The silica, which occurs in Georgia opal clay-stone, is in the form of opaline spheres 1500 to 8300 Å in diameter.

In sector-zoned crystals of elbaite tourmaline, the following findings were discovered (8 and 9): (a) sector-zoning (chemical differences among crystalline volumes created by growth on different faces, within otherwise single crystals) may occur in tourmaline by growth of one composition on the three faces (11.0), ($\bar{1}2.0$) and ($\bar{2}1.0$) and another composition on ($\bar{1}\bar{1}.0$), ($\bar{1}2.0$), and ($2\bar{1}.0$);

(b) most, but not all, the sector-zone boundaries involve concentrations of dislocation-type faults with Burgers vectors aligned perpendicular to the boundaries; (c) rare misorientations of lattices across sector-zone boundaries are on the order of 40 seconds of arc, involving rotations about axes normal to the boundaries; and (d) additional poorly-characterized misorientations occur, involving rotations of about 15 seconds of arc around axes parallel to $[00.1]$.

(References cited are given in the List of Publications Acknowledging PRF Support.)

LIST OF PUBLICATIONS ACKNOWLEDGING PRF SUPPORT

PRF # 1477-G3

PRINCIPAL INVESTIGATOR C. O. Pollard INSTITUTION Georgia Institute of Tech.

TITLE OF GRANT Oriented Crystalline Reactions, Intergrowths, and Overgrowths

- (1) C. O. Pollard, Jr., "Semidisplacive mechanism for diagenetic alteration of montmorillonite layers to illite layers", Appendix to Geol. Soc. Amer. Spec. Paper 134, 79 (1971).
- (2) C. O. Pollard, Jr. and L. D. Pollard, "Polytypism in 2:1 dioctahedral phyllosilicates: Interlayer and intralayer rotations (Abstract)", Clay Minerals Society, 19th Annual Mtg., Miami, Fla. (1970).
- (3) C. O. Pollard, Jr. and L. D. Pollard, "Polytypism in 3T muscovite: interlayer and intralayer rotations", In preparation (1972).
- (4) C. O. Pollard, Jr. and L. D. Pollard, "Modes of replacement in a pseudomorph after pyrite (Abstract)", Mineral. Soc. Amer. joint conference with Clay Minerals Soc., Rapid City, S. D. (1971).
- (5) L. D. Pollard and C. O. Pollard, Jr., "Microcrystalline habits of iron-bearing phases of pseudomorphs after pyrite from the Georgia Piedmont (Abstract)", Southeastern Section, Geol. Soc. Amer. Annual Meeting, Tuscaloosa, Ala. (1972).
- (6) C. O. Pollard, Jr., C. E. Weaver, and K. C. Beck, "Anatomy of a silica nodule (Abstract)", Southeastern Section, Geol. Soc. Amer. Annual Meeting (1971).
- (7) C. O. Pollard, Jr. and C. E. Weaver, "Opaline spheres: Loosely-packed aggregates from silica nodule in diatomaceous Miocene smectite-attapulgitic - sepiolite", In preparation (1972).
- (8) C. O. Pollard, Jr. and C. E. Wagner, "X-ray diffraction topographic and source-image distortion study of sector zoning in a tourmaline crystal (Oral)", Amer. Geophys. Union Conference on Petrologic Crystal Chemistry (1971).
- (9) C. O. Pollard, Jr. and C. E. Wagner, "X-ray diffraction topographic and source-image distortion study of sector zoning in an Elbaite tourmaline crystal", In preparation (1972).

ANNUAL FINANCIAL STATEMENT
(Please submit in Duplicate)

Project B-350

AMERICAN CHEMICAL SOCIETY - THE PETROLEUM RESEARCH FUND

For the Period: September 1, 1971 to August 31, 1972
(Give dates of period covered by this report - usually
September 1, 19__ to August 31, 19__; except for the
first period of the grant which may be more than 12
months ending August 31, 19__.)

Balance at Start of Reporting Period		<u>1,111.72</u>
Received from PRF During Reporting Period		<u> </u>
Salaries to:		
Principal Investigator	<u>857.19</u>	
(Contribution toward summer salary)		
Graduate or Undergraduate Students	<u> </u>	
Postdoctoral Fellows	<u> </u>	
Technical, clerical	<u>(14.47)</u>	
Fellowships or Scholarships to:		
Undergraduate Scholars	<u> </u>	
Graduate Fellows	<u> </u>	
Postdoctoral Fellows	<u> </u>	
Tuition	<u> </u>	
Materials and Supplies	<u>269.00</u>	
Equipment	<u> </u>	
Travel	<u> </u>	
Other Expenses	<u> </u>	
Institutional Supplement*	<u> </u>	
Departmental Supplement*	<u> </u>	
*(If provided in grant agreement)		
Total Expenditures During Reporting Period	<u>1,111.72</u>	
Balance on Hand at End of Period		<u>-</u>

Total of PRF Grant Payments Received to Date		<u> </u>

Approved _____		10/3/72
(Financial Officer's Signature)		(Date)

Georgia Institute of Technology
(Institution)

Charles O. Pollard
(Name of Principal Investigator)

PRF No. 1477-G3

PERSONNEL STATEMENT

PRF # 1477-G3 REPORTING PERIOD September 1, 1968 TO August 31, 1972

PRINCIPAL INVESTIGATOR C. O. Pollard INSTITUTION, Georgia Institute of Technology
ACADEMIC DEPT.

TITLE OF GRANT Oriented Crystalline Reactions, Intergrowths, and Overgrowths

UNDERGRADUATE SCHOLARS, PREDOCTORAL FELLOWS OR ASSISTANTS, AND
POSTDOCTORAL FELLOWS RECEIVING STIPENDS UNDER ABOVE NAMED GRANT

NAME	TITLE, OR ACADEMIC APPOINTMENT	PREVIOUS EDUCATION & DEGREES ¹	COUNTRY OF PERMANENT RESIDENCE	FRACTION OF INDIVIDUAL'S TOTAL SUPPORT FROM PRF (IN REPORTING PERIOD)	DEGREES RECEIVED (IF ANY, DURING REPORTING PERIOD)
Uday R. Bhate	G.R.A.	B.A. University of Bombay	India	One-sixth time for 1 qtr.	None
J.M. Dornish	G.R.A.	B.A. Rollins College	U.S.	One-sixth time for 1 qtr.	None

OTHER PERSONNEL ENGAGED IN RESEARCH ON GRANT BUT
NOT DIRECTLY SUPPORTED WITH ACS-PRF FUNDS

NAME	SOURCE OF SUPPORT	DATES ASSOCIATED WITH GRANT RESEARCH
Dr. Lin D. Pollard	Emory University	Last two years.

¹ For graduate students, indicate the name of College or University attended prior to graduate work; for post-doctoral fellows give the name of the Ph.D. granting institution.