GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. _____

Project No. E-19-522 GTRI/GIT DATE 6 / 16 / 83

Project Director: Dr. Robert F. Hochman School/Lab ChE

Sponsor: DHHS/PHS/National Institute of Dental Research

Type Agreement: Grant No. 5T32 DE07053-08 DSR

Award Period: From 7/01/83 To 6/30/84 (Performance) 9/30/84 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated:	$	$ 85,796
Funded:	$	$ 85,796

Cost Sharing Amount: $ _____ Cost Sharing No: _____

Title: Postdoctoral - Predoctoral Training in Dental Medicine

ADMINISTRATIVE DATA OCA Contact Frank Huff

1) Sponsor Technical Contact:

Dr. Thomas M. Valega
Chief, Restorative Materials Program Branch
Extramural Programs NIDR; Public Health Serv.
Dept. of Health and Human Services
Bethesda, MD 20205
(301) 496-7491

2) Sponsor Admin/Contractual Matters:

Robert Ginsburg
Grants Management Officer
Extramural Programs NIDR
Public Health Service
Dept. of Health and Human Services
Bethesda, MD 20205 (301) 496-7437

Defense Priority Rating: None Military Security Classification: None

(or) Company/Industrial Proprietary: _____

RESTRICTIONS

See Attached NIH 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 GIT; however, we are accountable for all equipment purchased.

COMMENTS:

Continuation of E-19-511

COPIES TO:

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Accounting	Research Communications (2)	Other I. Newton

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

2-SR428

Date 1/16/85

Project No. E-19-522 School/~~XXX~~ ChE

Includes Subproject No.(s)

Project Director(s) Hochman ~~XXXXX~~ / GIT

Sponsor DHHS/PHS/Nat'l Institute of Dental Res.

Title Dental Materials Science

Effective Completion Date: 6/30/84 (Performance) 9/30/84 (Reports)

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [ ] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [X] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other

Continues Project No. E-19-511 Continued by Project No. E-19-532

COPIES TO:

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Other M. Heyser; A. Jones

E-111-7

SECTION IV SUMMARY PROGRESS REPORT	NUM DE 07053-09	
PROGRAM DIRECTOR (Last, First, Initial)	PERIOD COVERED BY THIS REPORT	
Hochman, Robert F.	FROM	THROUGH
NAME OF ORGANIZATION		
Georgia Institute of Technology	7/1/84	6/30/85

TITLE OF PROGRAM (Repeat title shown in Item 1 on first page)

Graduate-Postdoctoral Training in Dental Materials

1. Describe accomplishments since last report. Describe the significance of any changes in the direction taken by the program during this period.
2. Publications pending or published and not previously reported? ☐ No ☒ Yes If "Yes," list below.
3. Foreign travel undertaken during the above period? ☒ No ☐ Yes If "Yes," describe below.

I. PROGRAM ACCOMPLISHMENTS

Dr. Brent Carter continues his studies in surface analysis methods. This work includes studies at Physical Electronics and the University of Minnesota, (NSF) Surface Science Center. Research has included utilizing scanning Auger analysis, secondary ion microscopy and ESCA. His work has involved initial studies of the microchemical characteristics of dental restorative material surface's and biologically exposed dental alloys. The area of micro surface analysis, with Dr. Carter's guidance, has been developed at Tech to the point that several hundred thousand dollars of institutional funds will be devoted to obtaining the sophisticated state-of-the-art equipment required for this experimental research. It is planned to devote a significant amount of study to the dental-bio area, particularly the loss of ions from metallic surfaces.

During this period Dr. A. Velazco, a Postdoctoral on this program, working in conjunction with Emory University, studied the "Release of Metal Ions From Biomaterials Employed for Dental and Orthopaedic Prostheses". Recent studies suggest that metal ions from alloys used for dental and orthopaedic prostheses can be released to the biological environment. In previous investigations elevated levels of cobalt, chromium, and nickel were found in serum of patients receiving cobalt-chromium alloy implants. As a first stage to investigating this problem, two separate, but related protocols were being designed to answer two questions:

A. How much cobalt, chromium, and nickel are released from cobalt-chromium prostheses?

B. What is the distribution of the cobalt, chromium, and nickel in the body?

A second study by Dr. Velaco is on porous coatings which can serve as the attachment vehicle for artificial tooth roots. The bone ingrowth into the porous coating produces an interlocking bond with surrounding alveolar bone which can serve to stabilize the dental implant. The questions he is studying are which materials might best serve as porous coatings and the time course of histological changes around porous-coated dental implants. Recent animal studies suggest that porous polyethylene has insufficient strength to serve as a porous coating for artificial tooth roots while porous polysulfone has adequate mechanical properties.

Dr. E. I. Meletis continues his work in surface modification and evolution of high temperature biomaterials. New surface modification processes, which may deter initiation of failure, may greatly extend the total life of a material. These methods of surface modification create unique new surface characteristics

with structures much more resistant when exposed to friction and wear, corrosion and oxidation, fatigue and fracture, and other degradation processes. The processes deal principally with surface and subsurface changes and may be summmarized as follows:

i) Treatments which result in a major change of composition at or below the surface of the metal, e.g. ion implantation and ion beam mixing;

ii) Treatments which result in surface deposits, but with an intimate surface interaction after in vaco cleaning, e.g. ion plating;

iii) Treatments which change the surface structure without a major change in surface composition, such as laser and electron beam annealing and glazing.

Of principle interest is Dr. Meletis' work on the potential of corrosion resistant biocompatible materials.

The newest postdoctoral is Dr. Marlon Jackson D.D.S., a recent graduate of the Emory University Dental School. He has started his intensive material course program and is working on basic material laboratory skills. He is the replacement for Dr. Velazco who left the program on June 30, 1983.

Mr. Jay Lozier is studying pure metal and alloy deterioration in sulfide-containing environments. The research to date has been mostly phenomenological and restricted to specific alloys. The principle objective of the proposed study is to determine the fundamental kinetic parameters of electrochemical reactions on selected metals including silver, copper and nickel in aqueous sulfide solutions.

The test are being performed in both aerated and deaerated aqueous sodium sulfide solutions of varying concentrations at 25^{o}C. The experimental methods include measurements of electrode potentials vs. time and potentiodynamic polarization curves. Tafel slopes, reaction rates, and critical potentials data will be related to basic sulfide corrosion behavior.

Mr. S. Heydat, a predoctoral, is working with Dr. Meletis on the extensive research in surface modification. This is covered in detail under the work reported for Dr. Meletis.

II. CONTINUATION PROGRAM

The basic objectives of the program will be to continue to conduct the indepth training in materials for the trainees involved, both academically and in basic dental materials research.

(Cont'd)

III. PROGRAM DIRECTOR'S ASSURANCE

"The undersigned agrees to accept responsibility for the scientific and technical conduct of the project and for provision of required progress reports if a grant is awarded as the result of this application."

1/30/84
Date

Program Director