15:05:08 OCA PAD AMENDMENT - PROJECT HEADER INFORMATION 12/20/94

Active

Project #: E-25-W38 Cost share #: Rev #: 4
Center # : 10/24-6-R8009-0A0 Center shr #: OCA file #:
Work type : RES
Contract#: 33142401 Mod #: BUDGET REVISION Document : CONT
Prime #: DOE W-31-109-ENG-38 Contract entity: GTRC

Subprojects ? : N CFDA:
Main project #: PE #:

Project unit: MECH ENGR Unit code: 02.010.126
Project director(s):
DANYLUK S MECH ENGR (404)894-9687

Sponsor/division names: ARGONNE NATIONAL LAB / ILLINOIS
Sponsor/division codes: 240 / 008

Award period: 931001 to 950930 (performance) 950930 (reports)

Sponsor amount	New this change	Total to date
Contract value	0.00	36,524.00
Funded	0.00	36,524.00
Cost sharing amount		0.00

Does subcontracting plan apply ?: N

Title: INTERFACIAL STUDIES OF BSCCO-AG

PROJECT ADMINISTRATION DATA

OCA contact: Anita D. Rowland 894-4820

Sponsor technical contact

DR. MICHAEL LANAGAN
(708)252-5871

ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
BUILDING 212
ARGONNE, IL 60439

Sponsor issuing office

DIANNE HUTCHINSON-WRAY
(708)252-7955

ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, IL 60439

Security class (U,C,S,TS) : U ONR resident rep. is ACO (Y/N): N
Defense priority rating : supplemental sheet
Equipment title vests with: Sponsor GIT
NONE PROPOSED.
Administrative comments -
PROCESSED BUDGET REVISION, ATTACHED

SE-254

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

NOTICE OF PROJECT CLOSEOUT

Closeout Notice Date 11/02/95

Project No. E-25-W38_____ Center No. 10/24-6-R8009-0A0_

Project Director DANYLUK S_____ School/Lab MECH ENGR_____

Sponsor ARGONNE NATIONAL LAB/ILLINOIS_____

Contract/Grant No. 33142401_____ Contract Entity GTRC

Prime Contract No. DOE W-31-109-ENG-38_____

Title INTERFACIAL STUDIES OF BSCCO-AG_____

Effective Completion Date 950930 (Performance) 950930 (Reports)

Closeout Actions Required:	Y/N	Date Submitted
Final Invoice or Copy of Final Invoice	Y	_____
Final Report of Inventions and/or Subcontracts	Y	_____
Government Property Inventory & Related Certificate	Y	_____
Classified Material Certificate	N	_____
Release and Assignment	Y	_____
Other _____	N	_____

Comments_____

_____

Subproject Under Main Project No. _____

Continues Project No. _____

Distribution Required:

Project Director	Y
Administrative Network Representative	Y
GTRI Accounting/Grants and Contracts	Y
Procurement/Supply Services	Y
Research Property Managment	Y
Research Security Services	N
Reports Coordinator (OCA)	Y
GTRC	Y
Project File	Y
Other _____	N
_____	N

NOTE: Final Patent Questionnaire sent to PDPI.

E-25-W38

#1

Georgia Tech

THE GEORGE W. WOODRUFF SCHOOL OF
MECHANICAL ENGINEERING

Georgia Institute of Technology
Atlanta, Georgia 30332-0405
USA

October 20, 1995

Dr. Michael Lanagan
Argonne National Laboratory
9700 South Cass Avenue
Building 212
Argonne, IL 60439

Dear Dr. Lanagan:

Enclosed please find the Final Report for Grant No. 33142401, "Interfacial Studies of BSCCO-Ag". Thank you for your support.

Yours truly,

Steven Danyluk
Morris M. Bryan, Jr. Chair in
Mechanical Engineering for
Advanced Manufacturing Systems

SD/nm

Enclosure

FINAL REPORT

October 1, 1993 - September 30, 1995

INTERFACIAL STUDIES OF BSCCO-Ag

for

Argonne National Laboratory
9700 South Cass Avenue
Building 212
Argonne, IL 60439

by

Steven Danyluk and Yue Fang
Georgia Institute of Technology
George W. Woodruff School of Mechanical Engineering
Atlanta, GA 30332-0405

October 20, 1995

FINAL REPORT
INTERFACIAL STUDIES OF BSCC0-AG

Steven Danyluk and Yue Fang
Georgia Institute of Technology
George W. Woodruff School of Mechanical Engineering
Atlanta, GA 30332-0405

SUMMARY

The current and voltage distribution of Ag/BSCCO is calculated using an analytical model from interfacial resistivity and geometric parameters. The results show that the solutions depend on only one dimensionless parameter, λL, where L is the length of the interface and λ is equal to the square root of the ratio of the resistance of the Ag to the interfacial resistance between the Ag and the BSCCO. When λL is high (>20), i.e., a very small interfacial resistivity, current from the Ag can be injected into the BSCCO within a very short distance. When λL is low (< 1), most of the current flows in the Ag. The current is shared between the Ag and the BSCCO for intermediate values of λL. The interfacial resistivity at 77 K was measured to be as low as 10^{-10} and 10^{-9} Ωcm^2 for Ag/Bi-2212 and Ag/Bi-2223, respectively. The theoretical model was verified by measuring the voltage distribution along the Ag in the Ag/Bi-2223 bars.

Current-voltage (I-V) characteristics and critical currents at 77 K were measured in the Ag/Bi-2223 bars with and without a defect induced by a cut in Bi-2223. The results show that the shunt effect of the Ag on the critical current can be negligible at 77 K and the contact resistance effect on the I-V curves is not significant for very low contact resistivities such as 10^{-8}–10^{-9} Ωcm^2. I-V curves of Bi-2223 or Ag/Bi-2223 can be described by a universal formula, which includes the flux creep at I <= Ic and the flux flow at I > Ic. The partial crack effect on critical current was estimated by another model, assuming that the behavior of the superconductor in both cracked and non-cracked regions have the same relationship of current density and electrical field. Degradation of the critical current in Ag/Bi-2223 bars with a purposely-made cut was measured at 77 K, and compared with a calculation from a model. Implications of the crack effect for monofilament and multifilament tapes are evaluated. The results show that a propagating crack is more harmful than an increase in partial crack density. A multifilamentary tape may tolerate a number of small cracks before degradation in the critical current density is observed.