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Standard Report

Document Status: With Owner

EPSRC Reference: GR/S62857/01

Scheme: Standard Research
Programme: Metals Programme

Award Holding Organisation

Organisation	University of Cambridge	Research Organisation Reference:	RG 37719 LJAG/152
Division or Department	Materials Science & Metallurgy		

Title of Research Project

Phase transformations in constrained weld and parent metals during cooling

Project Details

Start Date	01/05/2004	Duration of Grant (months)	36
End Date	30/04/2007		
Report Due Date	30/07/2007		

Funds Awarded

Description	Value
Staff	£ 37,211.00
Travel and Subsistence	£ 3,343.00
Consumables	£ 16,091.00
Exceptional Items	£ 15,355.00
Equipment	£ 4,000.00
Indirect Costs	£ 17,117.00
Funds Awarded	£ 93,117.00
Grant Total	£ 93,117.00

Investigators

Role	Name	Organisation	Division or Department
Principal Investigator	Professor H Bhadeshia	University of Cambridge	Materials Science & Metallurgy

Objectives

The main objectives of the research [up to 4000 chars] at proposal time

We will undertake the first quantitative real time monitoring of weld transformation during weld cooling as a function of thermal history and weld chemistry.-
Evaluate the extent to which superimposed weld constraint affects the transformation.
Refine computer models for the evolution of microstructure in steels and weld deposits.
Devise new welding alloys which minimise residual stress whilst at the same time having other desirable properties such as good toughness. Evaluate the new weld chemistries through direct measurements of stress and toughness.

The main objectives of the research [up to 4000 chars] at report time

No significant changes from original objectives.

Summary

The research described in simple terms in a way that it could be publicised to a general audience. [up to 4000 chars]

Proposal time

Report time

Many major engineering failures occur due to fatigue exacerbated by residual stresses introduced during welding. We have developed the theory needed to design weld metals which compensate for the stresses, exploiting the deformation which accompanies changes in crystal structures. The theory has been validated and implemented in real welds.

Add web address : <http://www.msm.cam.ac.uk/phase-trans>

Beneficiaries

Follow on Support

Awarding Organisation	Application Reference	Title of Project	Decision Made	Award Made	Start Date	End Date	Amount Sought / Awarded (£)
Ministry of Defence [Govt Department / Research Establishment]	R&T/1/0232	Eliminating residual stress in welded joints using transformation plasticity	Yes	Yes	01/11/2005	31/10/2010	551234
Ministry of Defence [Govt Department / Research Establishment]	N/A	Property variations in welded pressure vessel steel	No	No	01/10/2007	31/12/2007	27359

Staff

Role Name	Name / Post Identifier	Duration	% FTE	Gender	Qualifications gained on project
Project Student	Dr Sourabh Kundu	36	100	Male	Ph.D.

Staff Destinations

Name	Organisation details	Employment type
Dr Sourabh Kundu	Tata Steel / Corus Jamshedpur India	Private sector, industry or commerce - research related

Project Partners

Details of partners in the project and their contributions to the research.

1	Organisation Details	Contact Details			
	ESAB Sverige AB Herkulesgatan 72 Box 8004 SE-402 77 Gothenburg SWEDEN				
Direct contribution to project			Indirect contribution to project		
	Description	Value (£)		Description	Value (£)
Cash		Use of Facilities / Equipment			
Equipment / Materials		Staff time			
Secondment of staff		Other			
Other					
Direct contribution sub-total		0.00	Indirect contribution sub-total		0.00
Comments on partnership					

Total Contribution from all Project Partners (£)	0.00
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Publication Summary

	Journal	Refereed Journal	Conference Proceedings	Book	Other
Total	0	5	2	0	6
Number of Reviewed (if different from above)	0	0	2	0	0
Total with Industrial Co-Author	0	0	2	0	0
Total with International Co-Author	0	1	2	0	0

Publications

Type	Title	Author(s)	Reference				Reviewed	International Co-Author	Industrial Co-Author
			Name	Year	Vol.	Page			
Journal	Frontiers in the modelling of steel weld deposits	Professor Harshad Bhadeshia	Journal of the Japan Welding Society	2007	76	26-32	Yes	No	No
Journal	Transformation texture in deformed stainless steel	Dr Sourabh Kundu Professor Harshad Bhadeshia	Scripta Materialia	2006	55	779-781	Yes	No	No
Journal	Crystallographic texture of stress-affected bainite	Dr S Kundu Mr Kazu Hase Professor Harshad Bhadeshia	Proceedings of the Royal Society A	2007	463	2309-2328	Yes	Yes	Yes
Journal	Crystallographic texture and intervening transformations	Dr Sourabh Kundu Professor Harshad Bhadeshia	Scripta Materialia	2007	57	In press	Yes	No	No
Conference	Transformation temperatures and welding residual stresses in ferritic steels	Dr John Francis Dr Howard Stone Dr Sourabh Kundu Dr Rob Rogge Professor Harshad Bhadeshia Professor Philip Withers Dr Leif Karlsson	Proceedings of Pressure Vessels and Piping 2007	2007		1-8	Yes	Yes	Yes

Revenue

Please estimate the total value raised from the Intellectual Property generated through the grant (£)

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Grant Conditions

SCHEME CONDITIONS

RGC: Research Grants

: The principles governing the funding and management of research and postgraduate training are set out in the EPSRC's Research Framework Agreements with the universities and other higher education organisations, in the form of obligations accepted by both the EPSRC and the universities. The terms and conditions of research grants expand on these principles. In accordance with the undertaking given in the Research Framework Agreements, the EPSRC reserves the right to amend these terms and conditions, but will consult organisations before major changes are introduced.

GC 1 Responsibilities of the Host Organisation

Research grants are provided by the EPSRC for the support of research which has been proposed by the organisation and accepted (or modified) by the EPSRC as a basis for a research grant.

The organisation must notify the EPSRC of any change in its status, or that of any of the investigators, which might affect the eligibility to hold a research grant.

The organisation must meet the salaries costs of investigators and the general premises costs in support of the research.

The organisation is required to have in place agreed procedures for governing good scientific practice that meet the requirements of the EPSRC publication "Good Practice in Scientific and Engineering Research". The organisation must ensure that there are reliable systems and processes in place for the prevention of scientific misconduct e.g. plagiarism, falsification of data, together with well defined and clearly publicised arrangements for investigating and resolving allegations of scientific misconduct. Where an allegation of scientific misconduct arises in respect of a researcher supported by a research grant, the EPSRC must be informed immediately and advised of the outcome of any investigation.

The organisation is responsible for managing and monitoring the conduct of medical and health research consistent with the Department of Health's Research Governance Framework. In particular, significant development should be reviewed as the research proceeds, especially any that risk the safety of individuals. The EPSRC must be notified about any resulting modifications to research objectives, approach or design.

If the approval of a Research Ethics Committee is required for the research, the organisation and the Principal Investigator have an absolute responsibility for ensuring that such approval is granted before any research is undertaken. Any variation in a project that affects the nature or degree of the hazard to which any human participants are exposed must be treated as a new investigation, for which fresh Research Ethics Committee approval must be obtained. Any serious incident arising during the course of the research should be reported immediately to the EPSRC, as well as to the Research Ethics Committee. The research should be suspended until the Research Ethics Committee has decided whether it may be continued.

GC 2 Use of Funds

The funds awarded will include a sum to take account of expected inflation and pay awards over the period of the grant. The funds are thus cash limited and the grant is made on the understanding that its value will not be increased. Subject to the following conditions, the funds may be deployed, without reference to the EPSRC, in such a manner as to best carry out the research.

GC 3 Starting Procedures

The start date of a research grant will normally be the day on which work commences on the project. Notification of this date, by submission of the starting certificate, will activate the profiled payments.

The start date for payment will be as follows:

Research grants with staff: the date on which the first staff supported by the grant start work

Research grants with staff, where it is intended that staff should not be in post at the start of the grant: the date on which expenditure on any other heading is first incurred. The payment schedule will take account of such cases where they have been notified in the application and approved in the grant offer

Research grants without staff: the date on which expenditure is first incurred

The start of a research grant may be delayed by up to 6 months after the announced start date, the duration of the grant remaining unchanged. The grant will lapse if not started within 6 months of the announced start date.

For grants with items of large capital (single items of equipment over £100,000) expenditure for such items may be incurred before work commences. The start date of the period covered by the claim will be regarded as the actual start date of the grant. If the grant also includes profiled payments, these will not be activated until the starting certificate has been received.

GC 4 Extensions

After a research grant has started the duration may be extended by up to 6 months where there have been breaks or delays in the appointment of staff, including project students. The EPSRC must be notified of such extensions once the date of appointment of the staff concerned is known. A research grant may also be extended to cover periods of maternity or paid sick leave for staff funded by the grant.

GC 5 Claims for Large Capital

Claims are required for large capital (single items of equipment over £100,000) which are specified in the grant offer letter. Claims must be submitted in arrears on the Large Capital claim form. Receipt of a claim will not in itself activate profiled payments.

Claims should be accompanied by an invoice for the relevant equipment; failure to supply this information will result in the claim being returned. Reimbursement will be limited to the actual price paid. If the amount claimed exceeds the value awarded under that heading, the excess must be found from other headings in the grant and itemised in the final expenditure statement.

GC 6 Transfers between Headings

The organisation must not over-commit expenditure against the research grant as a whole, but may increase the amounts within individual headings of expenditure by transfer from other headings, subject to the following restrictions:

Funds provided for Large Capital, or savings on the purchase of such items, are not transferable without prior written approval

Funds provided for the purchase of equipment items in excess of £25,000 must not be transferred, nor used to buy other equipment, without prior written approval;

Public communication training funds are not transferable

Indirect costs cannot be transferred

An explanation must be given in the Individual Grant Review where expenditure differs from the sum awarded under a particular heading by more than

20%.

GC 7 Staff and Indirect Costs

The organisation must accept all the normal duties and responsibilities of an employer.

The staff engaged must be appointed by the organisation on terms that are the same as those for comparable posts in the organisation. Research staff appointed under a research grant may engage in teaching and demonstrating for up to 6 hours a week during normal working hours provided that this work is related to the research project to which they were appointed.

Funds for project students are included in the staff heading and students should be appointed in accordance with the organisation's own terms and conditions. Organisations are nevertheless encouraged to take account of the guidance on quality and standards that apply to the EPSRC's research studentships funded through Doctoral Training Grants.

Similarly, the stipend paid to project students is at the discretion of the organisation, subject to finding the costs from within the total grant, subject to the following paragraph.

If the staff heading is increased by transfer from another heading, sufficient funds must also be transferred to the indirect costs heading.

GC 8 Procurement of Equipment

The procurement of equipment must comply with the relevant national and EU legislation and the organisation's own financial and procurement policy. As a minimum, the guidance procurement best practice issued by the Joint Procurement Policy and Strategy Group (JPPSG) must be observed. The guiding principle behind the approach to procurement must be that of obtaining value, in relation to both the research project and the use of public funds.

The procurement process should have regard for the total cost of purchasing, operating and maintaining equipment, not just the initial capital cost. Whole-life costs, including arrangements for warranties, training and maintenance, should all feature in the purchasing decision. Professional procurement staff at the organisation must be consulted concerning the purchase of equipment exceeding £25,000 and their advice and skills utilised for the tendering and negotiation process.

Non-binding quotations should be obtained in advance of the submission of an application so that the value of any resulting grant can more closely reflect actual requirements. Proposals that include requests for equipment up to £100,000 should be accompanied by three quotations, obtained by telephone. For items costing more than £100,000 at least three written quotations should be provided.

Purchase of equipment costing less than £25,000 may make use of call-off contracts and other preferred suppliers, where these have already satisfied competition objectives, as an alternative to competitive tendering. For higher value equipment, organisations should endeavour to coordinate their purchasing with others in order to increase their buying power and scope for negotiation with suppliers.

Contract terms for the supply of equipment should seek to protect the position of the organisation against the possibility of failure by the supplier to deliver on time, to cost or to the agreed specification. The standard terms and conditions promoted by the Research Equipment Affinity Group should be adopted where possible. In general, advance payments and payments on delivery should be avoided. It is preferable to agree acceptance criteria in advance with the supplier and make payments conditional on satisfactory testing against these criteria, holding back a final payment until the equipment has been fully commissioned.

GC 9 Use of Equipment

Equipment is provided primarily for use on the research project for which the research grant has been awarded, and belongs to the organisation. In certain circumstances, the EPSRC may wish to retain ownership throughout the period of the grant, and possibly beyond. In such cases, the grant will be subject to a Grant Additional Condition.

The EPSRC must be informed if, during the life of the research grant, the need for the equipment diminishes substantially or it is not used for the purpose for which it was funded. The EPSRC reserves the right in these circumstances to determine the disposal of such equipment and to claim the proceeds of any sale.

Any proposal to transfer ownership of the equipment during the period of the research grant is subject to approval from the EPSRC. After the research grant has ended, the organisation is free to use the equipment without reference to the EPSRC, but is nevertheless expected to maintain it for research purposes as long as is practicable.

Where there is spare capacity in the use of equipment, the EPSRC expects this to be made available to other users. Priority should be given to

research supported by any of the Research Councils and then to Research Council-funded students.

GC 10 Public Communication Training Funds

Public Communication Training Funds are available for the investigator, or other members of the research team, to contribute to the costs of training in the skills required for presenting aspects of the EPSRC- supported research to the general public. A statement on the use of the funds must be included in the Individual Grant Review.

GC 11 Transfer of Principal Investigator

The organisation must notify the EPSRC if the Principal Investigator transfers to another organisation. If this organisation is eligible to hold research grants, the EPSRC would normally expect the grant to be transferred with the Investigator. Written agreement to this is required from both the relinquishing and receiving organisations. Where there is a basis for continued involvement by the relinquishing organisation, agreement should be reached between both organisations on the apportionment of work and distribution of related funding. The EPSRC will not normally agree to separate grants in these circumstances.

Should it not prove possible to agree suitable arrangements to enable the project to be undertaken, or to continue, in accordance with its original objectives, the EPSRC will consider withdrawing its offer of support or terminating the grant.

GC 12 Non-negligent Harm

Medical and health-related research may involve trials with human participants. Any such trials require prior approval by a Research Ethics Committee.

The EPSRC will give consideration to claims for non-negligent harm suffered by a person as a result of a trial or other work connected to a medical or health-related project. This does not extend to liability for non-negligent harm arising from conventional treatment where this is part of a trial.

Where studies are carried out in a hospital, the hospital has a duty of care to all the patients it is treating. The EPSRC does not accept liability for any breach in the hospital's duty of care, or any negligence on the part of its employees. This applies whether the hospital is part of an NHS Trust or otherwise.

GC 13 Expenditure Statements

Expenditure statements are used to reconcile the actual expenditure incurred during the life of a research grant against the payments made.

The organisation must complete and return a final expenditure statement (FES) within 3 months of the end of a research grant. Any request to extend the due date for receipt of the FES must be made in writing before the date has passed and be agreed by the EPSRC. Once an expenditure statement has been received by the EPSRC and the expenditure incurred has been reconciled against payments made, it will be considered as final. Facsimile or photocopies of the expenditure statement cannot be accepted.

Costs arising from maternity leave or paid sick leave should be identified in the exceptional items section of the expenditure statement.

Where items of equipment costing £25,000 or more have been purchased, copies of the invoices must be submitted with the expenditure statement. If such funds have been used to buy different equipment, or transferred to another heading, without prior written approval, the expenditure will not be met.

Where the duration of a research grant exceeds three years and six months, and where the grant has not already been reviewed, the EPSRC will send the organisation an interim expenditure statement for completion and return. No further payments will be made until the interim statement has been returned and accepted.

The EPSRC reserves the right to have reasonable access to inspect the relevant books, records and financial procedures associated with research grants or to appoint any other body or individual for the purpose of such inspection.

GC 14 Individual Grant Review

A report on the conduct and outcome of the project, the Individual Grant Review (IGR) must be submitted by the organisation within three months of the end of the research grant (one month for overseas travel grants), on the form provided by the EPSRC.

If there are exceptional reasons that will prevent submission of the IGR within the period allowed, a request may be made, before the due date passes,

for the submission period to be extended. Such requests must be made in writing and agreed by the EPSRC.

GC 15 Sanctions

Timely submission of the IGR and the final expenditure statement is essential.

The EPSRC will:

Not consider subsequent research proposals from an investigator until the IGR is received and accepted by the EPSRC

Recover 20% of the expenditure incurred on the grant if the IGR is not received within the period allowed

Recover 20% of the expenditure incurred on the grant if the FES is not received within the period allowed, and recover the whole amount paid if the FES is not received within six months of the end of the grant

Financial sanctions resulting from overdue IGRs and final expenditure statements operate independently. Agreement to extend the due date for one document does not automatically apply to the other. However, if both documents are late, the sanction remains at 20% of expenditure.

The final expenditure statement is required to enable the EPSRC to meet its responsibilities to account for the use of public funds; thus if the FES is not received within six months of the end of the research grant the EPSRC is unable to reconcile payments made against expenditure incurred and must recover all payments made against the grant.

GC 16 Annual Statement

The EPSRC will send an annual statement to the organisation showing the payments made for the previous financial year. The organisation is required to certify, by signing and returning the statement, that:

The expenditure shown has been incurred in accordance with the grant conditions, and that those grants shown as current are continuing

No further payments, including those for large capital, will be made until the signed annual statement has been received by the EPSRC.

GC 17 Commercial Exploitation

The EPSRC makes no claim to the intellectual property rights arising from the research it supports.

It is the responsibility of the organisation, and of all engaged in the research for which resources have been provided, to make every effort to ensure that any potentially valuable results obtained in the course of the research are exploited, and that there is a suitable return to the organisation and the researchers from any such exploitation. The organisation must ensure that all those associated with the research are aware of, and accept, the arrangements for exploitation.

The EPSRC expects any collaborative arrangements to be put on a formal basis, for example, through an agreement covering the contributions and rights of the organisations and individuals concerning exploitation. Such agreements must not conflict with the EPSRC's terms and conditions of research grants.

GC 18 Monitoring and Evaluation

The EPSRC reserves the right to monitor the research and to ask that the investigator attends meetings to exchange information and ideas with others who are pursuing research in the same or similar fields.

The investigator must make all reasonable efforts, if so invited, to attend a theme day or other activity organised by the EPSRC concerning the evaluation of the research undertaken through research grants. Such events may be held after a grant has finished.

GC 19 Publication

The investigator should, subject to the procedures laid down by the employing organisation, publish the results of the research arising from the

research grant in accordance with normal academic practice. Publications should acknowledge the support received from the EPSRC, quoting the grant reference number.

GC 20 Changes in Programme

In the event of any major change in the proposed research, or any change in circumstances which make it unlikely that the broad objectives of the research can be achieved, revised proposals should be submitted to the EPSRC. The EPSRC reserves the right to make a new research grant in place of the existing grant or to retain or cancel the existing research grant. If the existing grant is terminated, no liability for payment or redundancy or any other compensatory payment for the dismissal of staff funded by the grant will be accepted by the EPSRC, but negotiations will be entered into in regard to other contractual commitments and in regard to the disposal of assets acquired under the research grant.

GC 21 Disclaimer and Right to Revise or terminate the Research Grant

The EPSRC accepts no responsibility, financial or otherwise, for expenditure or liability arising from the research funded by the research grant, except as set out in these terms and conditions.

The EPSRC reserves the right to revise or terminate the research grant at any time, subject to reasonable notice and to the payment of any final instalment that may be necessary to cover outstanding and unavoidable commitments.

Self Assessment

	Not Applicable	Unsatisfactory	← Tending To	National Standing	Tending to →	Internationally leading	Relevance
Research Quality						✓	High
Research Planning and Practice					✓		High
Potential Scientific Impact						✓	High

	Not Applicable	Unsatisfactory	← Tending To	Good	Tending to →	Outstanding	Relevance
Quality of Training & Experience Provided						✓	High
Communication of Research Outputs						✓	High
Potential Benefits to Society					✓		High
Cost Effectiveness						✓	High