

# TWAS Fellowships for Postgraduate Research

## APPLICATION FORM

### BEFORE SENDING YOUR APPLICATION:

Please read the TWAS Postgraduate Fellowship Application Guidelines for information on how to apply for the different TWAS postgraduate programmes.

The application guidelines are available at <http://twas.ictp.it/prog/exchange/fells/fells-overview> or can be obtained from [fellowships@twas.org](mailto:fellowships@twas.org).

FOR SUBMISSION OF APPLICATION BY EMAIL, PLEASE NOTE THAT THIS IS A MICROSOFT WORD DOCUMENT AND SHOULD BE COMPLETED, SAVED AND RETURNED AS A WORD DOCUMENT AND NOT AS A PDF DOCUMENT OR EMBEDDED JPEG.

Please save the completed application form as an MS Word document with both your surname and the Fellowship's acronym in its file name. Example: If your name is John DOE, name the file "DOE\_DBTPG.doc" or "DOE\_CASPG.doc" as appropriate.

<b>To which TWAS Postgraduate Fellowship Programme does this application apply? (Please tick one box only). For CNPq, please refer to the online application at <a href="http://www.cnpq.br/editais/ct/2011/twas.htm">www.cnpq.br/editais/ct/2011/twas.htm</a>.</b>		
<input type="checkbox"/> TWAS-CAS (China) <input type="checkbox"/> TWAS-CSIR (India) <input type="checkbox"/> TWAS-DBT (India)	<input type="checkbox"/> TWAS-SN Bose (India) <input type="checkbox"/> TWAS-IACS (India) <input type="checkbox"/> TWAS-ICIPE (Kenya) <input type="checkbox"/> TWAS-USM (Malaysia)	<input type="checkbox"/> TWAS-CONACYT (Mexico) <input type="checkbox"/> TWAS-CEMB (Pakistan) <input type="checkbox"/> TWAS-ICCBS (Pakistan)
<b>For CSIR, DBT, S.N. Bose, CEMB and ICCBS only, please specify ONE of the following options (Please tick one box only)</b>		
<input type="checkbox"/> FULL-TIME (if you intend to register for a PhD in the host country)	<input type="checkbox"/> SANDWICH (if you are already registered for a PhD in your home country)	
<b>For our records, please also indicate the scientific field in which you work. (Please tick one box only)</b>		
<input type="checkbox"/> Agricultural Sciences <input type="checkbox"/> Structural, Cell & Molecular Biology <input type="checkbox"/> Biological Systems & Organisms	<input type="checkbox"/> Medical & Health Sciences, including Neurosciences <input type="checkbox"/> Chemical Sciences <input type="checkbox"/> Engineering Sciences	<input type="checkbox"/> Astronomy, Space & Earth Sciences <input type="checkbox"/> Mathematical Sciences <input type="checkbox"/> Physics

### GENERAL INFORMATION

Please remember to attach a photo of yourself as a separate JPEG file and copy of your passport, even if expired. Only the page with personal details is required. <b>In completing this form, please provide your surname and name exactly as they are indicated in your passport.</b>		
Surname (family name):		First name(s):
Gender: Male <input type="checkbox"/> Female <input type="checkbox"/> Nationality: Date of birth: Place of birth (country):	Passport No: Date and place issued: Expiry date:	
Applicant's contact address:		Name and contact details of a person to be contacted in case of an emergency:
Tel: Fax: E-Mail:		Tel: Fax: E-Mail:
<b>Accompanying dependents. NB: The Fellowships do not provide support for family members</b>		
Name	Relationship (mother, son...)	Period of stay

**ACADEMIC/PROFESSIONAL INFORMATION**

**Higher education** Please enclose copies of all degrees awarded and university-issued transcripts.

Degree awarded	Grade	Year	Field/Discipline	University

Date of commencement of PhD studies (if applicable)

**Academic/professional employment**

Name and address of employer(s)	From	To	Position

**Have you applied for TWAS programmes in the past? If so, specify which programme and date of application.**

**Previous TWAS awards/fellowships received**

**Referees.** Names, addresses and contact details of two senior scientists familiar with applicant’s work; their reference letters must be sent to TWAS and, if necessary, to the partner organization (see the “additional information” section of each fellowship programme in the application guidelines)

Referee 1	Referee 2
Name:	Name:
Surname:	Surname:
Address:	Address:
Tel:	Tel:
Fax:	Fax:
E-Mail:	E-Mail:
Relationship to candidate:	Relationship to candidate:

**Language skills**

	Understanding spoken language			Reading			Speaking			Writing		
	Excellent	Good	Poor	Excellent	Good	Poor	Excellent	Good	Poor	Excellent	Good	Poor
ENGLISH	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**FELLOWSHIP DETAILS**

**HOST INSTITUTION**

**Ensure you indicate the name and address of at least one HOST research institution where you have applied and have been accepted for all or part of your PhD research (depending on the programme).** Please attach official letter of acceptance signed by the head of department, postgraduate programme coordinator or programme partner’s contact person (as specified in the application guidelines for each specific fellowship programme) at the host institution.

1. Host institute, Name and Address:

Tel:	Fax:	E-mail:
Name and Surname of Host supervisor:	Position:	E-mail:

Reasons for selecting this institution and supervisor:		
<b>2. Host institute, Name and Address:</b>		
Tel:	Fax:	E-mail:
Name and Surname of Host supervisor:	Position:	E-mail:
Reasons for selecting this institution and supervisor:		

**HOME INSTITUTION**

<b>ONLY complete this section if registered for a PhD in your HOME country. In this case you will also have to submit a supporting letter from the Director of your HOME institution. In the case of CSIR, DBT, S.N.Bose, CEMB and ICCBS you will also have to submit a signed Registration and No Objection Certificate (see sample at the end).</b>		
<b>Name and Address of Home Institute:</b>		
Tel:	Fax:	E-mail:
<b>Name and position of PhD supervisor in your home country.</b>		
Name:	Surname:	Position:

**RESEARCH DETAILS**

<b>Area of proposed research/study</b>
<b>PhD project.</b> Please provide a detailed description of the proposed doctoral study/research plan. See sample on the last page. <b>NOTE: The project's title must be the same as in the preliminary acceptance letter.</b>
Title:
Project details
<b>Expected benefits.</b> Please provide a short account of the benefits the Fellowship will provide to you and your home institution.
<b>Applicant's acceptance of conditions governing the relevant TWAS Postgraduate Fellowship Programme.</b> Please note that unsigned applications cannot be accepted. If you are unable to send a scanned version via e-mail, please send the page with the signature by fax.
I accept the terms and conditions governing these Fellowships and I confirm that I shall return to my home country upon completion of my Fellowship.
Signature: _____ Date: _____
<i>N.B. The application form cannot be accepted without a signature.</i>

PLEASE ONLY RETURN THE COMPLETED PAGES AND THE FOLLOWING ENCLOSURES

**ENCLOSURES CHECKLIST****Important: Ensure that ALL relevant enclosures are included with the completed application form!**

- Passport size photograph as a separate JPEG file.
- A copy of passport, even if expired. Only the page with personal details is required.
- Detailed description of the proposed doctoral study/research plan (see sample on last page).
- Curriculum Vitae and complete list of publications (do not send papers).
- University degree certificates and relevant university transcripts of advanced courses for all academic degrees.
- Official letter of acceptance of a HOST institution as per sample attached. The acceptance letter must be signed by the head of department, postgraduate studies coordinator or programme partner's contact person (as specified in the application guidelines for each specific fellowship programme). The starting date on the acceptance letter must be the year following the application, e.g. If you apply for a fellowship in 2011 the acceptance letter should show the starting date as 2012.
- Reference letters: Referees must send SIGNED letters as attachments via e-mail directly to TWAS and the relevant programme partner (except in the cases of S.N.Bose, India; CONACYT, Mexico and ICCBS, Pakistan). The subject line must contain the name of the Fellowship programme and the candidate's surname. Alternatively, letters should be sent in sealed envelopes by post. N.B. Only signed reference letters can be accepted.
- Supporting statement from the head/director of the applicant's HOME institute on headed paper, if registered in the HOME country.
- Certificate of proficiency in English or language of country to be visited.
- Signed Registration and No Objection Certificate, if applicable.
- Supporting letter of PhD supervisor, if registered in the HOME country.
- Certificate of good health from a qualified medical doctor (for ICCBS only).

**OTHER INFORMATION****How did you find out about TWAS Fellowship Programmes? (Please tick one only)**

- Direct mailing [to institution].
- TWAS website.
- Word of mouth/email from colleague.
- Other (please specify):

## SAMPLE ACCEPTANCE LETTER FOR HOST INSTITUTIONS

It is important to note that applicants **MUST** already be accepted by a host institution in Brazil, China, India, Kenya, Malaysia, Mexico or Pakistan to be eligible for a TWAS Postgraduate Fellowship.

How to obtain the preliminary acceptance letter:

- 1) Identify a suitable host institution from the lists provided (see accompanying application guidelines).
- 2) Contact your selected host institution or a potential host supervisor, providing your CV, research proposal and a copy of the sample acceptance letter (see below).

Signed acceptance letters must be sent to TWAS and the relevant programme partner (except in the case of S.N.Bose, CONACYT and ICCBS). The head of department, coordinator of postgraduate studies or programme partner's contact person (as specified in the application guidelines for each specific fellowship programme) at the HOST institution must sign the letter. Informal communication exchanged with potential host supervisors can be submitted, but it will **not** be considered as formal evidence of institutional acceptance.

<p>HOST INSTITUTION'S LETTERHEAD</p> <p>Department's name Postgraduate programme's name Institutional address Tel and fax numbers E-mail address</p> <p>[Place and Date]</p> <p>Dear _____ [candidate's name and surname] - _____ [country of citizenship],</p> <p>This is to inform you that, as a candidate for a postgraduate fellowship under the agreement established by TWAS and _____ [programme partner], you have been accepted for a _____ [FULL-TIME or SANDWICH, please specify*] postgraduate programme of the duration of _____ [length of time, months/years, please specify] in _____ [field of specialization/academic programme] at this department/institution _____.</p> <p>If subsequently selected for a TWAS-_____ [programme partner] Fellowship, you should begin your studies/research in the _____ [first or second] academic semester of _____ (year) and expect to conclude by _____ [month and year]. While researching at this institution, you will be under the supervision of Professor _____ [name, and surname of supervisor] to be contacted at _____ [email address]. The topic for which you have been accepted to study at this institution is: _____.</p> <p>Yours sincerely,</p> <p>_____ <b>Signature</b> and name of head of department, postgraduate studies coordinator or programme partner's contact person as specified in the guidelines for each specific fellowship programme <i>N.B. The letter cannot be accepted without a signature.</i></p>
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*\* The FULL-TIME Fellowship applies to candidates who intend to register for a PhD in the host country. The SANDWICH Fellowship entails one research visit at the host institute for applicants who are already registered for a PhD in their home country. Please verify the minimum and maximum duration of the sandwich programme in the application guidelines (under the "additional information" section of each programme partner).*

### IMPORTANT NOTE:

**The starting date on the acceptance letter must be the year following the application e.g. If you apply for a fellowship in 2011 the acceptance letter should show the starting date as 2012.**

**SAMPLE REGISTRATION & NO OBJECTION CERTIFICATE FOR SANDWICH POSTGRADUATE FELLOWSHIP APPLICATIONS**

FOR APPLICANTS ALREADY REGISTERED FOR A PHD IN THEIR HOME COUNTRY

ONLY FOR CSIR, S.N. BOSE AND DBT (INDIA), CEMB AND ICCBS (PAKISTAN) SANDWICH FELLOWSHIP APPLICATIONS; FOR CNPQ SANDWICH FELLOWSHIPS REFER TO THE SAMPLE AVAILABLE AT [WWW.CNPQ.BR/EDITAIS/CT/2011/TWAS.HTM](http://WWW.CNPQ.BR/EDITAIS/CT/2011/TWAS.HTM)

[Institution's Letterhead]

[Institution's address and contact details]

**Registration & No Objection Certificate**

This is to certify that Mr/Mrs/Ms ....., son / daughter of ....., has been registered in the Department of..... at the University of ..... for a PhD in the area of ..... since .....

We hereby convey our No Objection towards his/her study/work in ..... [indicate host institution, city and country], and also agree to accept Host Supervisor, ..... [indicate title, name and surname of host supervisor] as a Co-Supervisor in the final assessment of the thesis/dissertation based on which the PhD degree could be offered to Mr/Mrs/Ms ..... by us.

[Signature with Seal]

NOTE: This certificate should be signed by the Vice-Chancellor or Registrar of the University where the candidate is registered for his/her PhD

## PROPOSED POSTGRADUATE STUDY/RESEARCH PLAN

**Applicant:** Name, SURNAME

**Title:** Studies on the properties of colossal magnetoresistance (CMR) in magnetic ceramics and thin films

### 1.0 Statement of Purpose

Perovskite manganites are a class of materials that have attracted enormous attention recently because they exhibit the so called colossal magnetoresistance (CMR) effect. These materials display dramatic change in their electrical resistance in an applied magnetic field. The changes are so large that the material can in fact change from an insulator to a metal. At high temperature these materials are paramagnetic insulators, while at low temperatures, they exhibit a number of phases including ferromagnetic metallic and anti ferromagnetic insulating.

The physics of CMR effect is focused on the mechanism of double exchange of carriers between the  $Mn^{3+}$  and  $Mn^{4+}$  ions. However double exchange alone is not able to explain the change of resistivity as exerted by many workers such as Millis *et al.* who suggested that strong electron-phonon coupling arising from Jahn-Teller effect plays a crucial role. The typical CMR material is derived from perovskite manganites with the chemical formula  $Ln_{1-x}A_xMnO_3$  where Ln is the rare earth (Ln = La, Pr, Nd, Sm) and A is the divalent metal (A = Ca, Ba, Sr).

In general, magnetoresistance is a measure of the change in electrical resistance as function of the magnetic field H and is usually calculated as:  $MR\% = [R(H) - R(0)]/R(0) \times 100$  where R(H) denotes the field dependent resistance and R(0) the resistance at zero magnetic field.

### 2.0 Objectives

#### 2.1 General Objective

To produce high quality homogenous dense bulk and thin films of  $La_{0.67}Ca_{0.33}MnO_3$  and  $La_{0.67}Sr_{0.33}MnO_3$  and  $La_{0.67}Er_{0.33}MnO_3$  using coprecipitation method that offers enhancement in CMR properties.

#### 2.2. Specific Objectives

- To produce high quality homogenous dense bulk of LCMO, LSMO and LErMO via coprecipitation method.
- To fabricate the thin film, using Pulsed Laser Ablation Deposition (PLAD) on various substrates.
- To investigate the magnetic properties and  $T_c$  determination using AC susceptometer in a temperature range of 25 K-300 K.
- To measure magnetoresistance (MR) effect.
- To investigate the electrical property and  $T_p$  determination, using standard four- point probe in a temperature range of 20 K to 300 K.

### 3.0 Methodology

#### (i) Fabrication of ceramic component using coprecipitation method

In this project, the polycrystalline samples of magnetoresistive LMCO, LSMO and LErMO will be prepared in bulk form via coprecipitation method.

#### (ii) Thin Film Preparation by Pulsed Laser Ablation Deposition (PLAD)

Today, PLAD is widely used for producing thin film. Conceptually and experimentally, PLAD is relatively simple. PLAD consists of a target holder and a substrate holder housed in a vacuum chamber. A high-power laser is used as an external energy source to vaporize the target material and to deposit the thin film. A set of optical components is used to focus the laser beam on the target surface. The chamber is pumped to high vacuum using a molecular pump.

Polycrystalline LCMO, LSMO and LErMO thin films, will be fabricated on polished GaAs(100) and Si(100) substrates by pulsed laser ablation deposition (PLAD) using a single LMCO polycrystal target.

UV radiation from an ND: YAG laser (wavelength 532nm) is focused onto a split target at an angle of incident of  $45^\circ$ . The laser is set to produce energy per pulse of 100 mJ and the beam is focused to spot size  $3 \text{ mm}^2$  at target, as measured from the total area of a stationary target affected by the laser beam. The target and substrate is 4 cm and the plume stopped just short of the substrate.

### 4.0 Expected Output

Production of CMR materials with improved properties as sensing elements.

### 5.0 References

### 6.0 Timeline/Budget (only if applicable)