

Indian Journal of Engineering & Materials Sciences

Editorial Board

Prof. David Barton
School of Mechanical Engineering
University of Leeds
Leeds LS2 9JT, United Kingdom

Prof. M L Munjal
Department of Mechanical Engineering
Indian Institute of Science
Bangalore 560 012, India

Prof. Upadrasta Ramamurty
Department of Materials Engineering
Indian Institute of Science
Bangalore 560 012, India

Prof. Gautam Biswas
Indian institute of Technology
Guwahati 781 039, India

Prof. B S Murty
Department of Metallurgical and
Materials Engineering
Indian institute of Technology Madras
Chennai 600 036, India

Prof. R J Sengwa
Department of Physics
J N V University
Jodhpur 342 001, India

Prof. J Paulo Davim
Department of Mechanical Engineering
University of Aveiro
Campus Santiago
Aveiro 3810-193, Portugal

Prof. Dumitru Nedelcu
Department of Machine Manufacturing
Technology
"Gheorghe Asachi"
Technical University of Iasi
Blvd. Mangeron nr. 59A, 700050
Iasi, Romania

Prof. B Suresha
Department of Mechanical Engineering
The National Institute of Engineering
Mysore 570 008, India

Prof. Wen-Hsiang Hsieh
Department of Automation Engineering
National Formosa University
Huwei, Yunlin 632, Taiwan

Prof. Paolo Vannucci
Department of Mechanical Engineering
University of Versailles and St. Quentin
55 Avenue de Paris, 78000 Versailles,
France

Prof. Suhas S Joshi
Department of Mechanical Engineering
Indian Institute of Technology Bombay
Powai, Mumbai 400 076, India

Prof. John Philip
Metallurgy & Materials Group
Indira Gandhi Centre for Atomic
Research
Kalpakkam 603 102, India

Prof. Tongmin Wang
School of Materials Science and
Engineering
Dalian University of Technology
Dalian 116024, China

Dr. Manoj Kumar Patariya
Director, CSIR-NISCAIR (*Ex-officio*)

Editor : Dr Shobhna Choudhary (shobhnachoudhary@niscair.res.in)

Editorial Assistant: Kirti Bansal (kirti@niscair.res.in)

Phone : 25841439, 25846301, 25846304-7; **Fax :** 0091-011-25847062; **E-mail :** ijems@niscair.res.in; **Website :** www.niscair.res.in

**CSIR-National Institute of Science Communication and Information Resources (NISCAIR), Dr K S Krishnan Marg,
New Delhi 110 012, India**

Indian Journal of Engineering & Materials Sciences is issued bimonthly (February, April, June, August, October, December) and is published by the NISCAIR in association with the Indian National Science Academy.

NISCAIR assumes no responsibility for the statements and opinions advanced by contributors. The editorial staff in its work of examining papers received for publication is helped, in an honorary capacity, by many distinguished engineers and scientists.

Communications for publication in the journal should be addressed to the Editor, Indian Journal of Engineering & Materials Sciences, National Institute of Science Communication and Information Resources, Dr K.S. Krishnan Marg, New Delhi 110 012, India.

Correspondence regarding subscriptions and advertisements should be addressed to the Sales & Distribution Officer, National Institute of Science Communication and Information Resources, Dr K.S. Krishnan Marg, New Delhi 110 012, India.

Phone : 25843359, 25846301, 25846304-07

Fax : 0091-011-25847062

E-mail : sales@niscair.res.in

Annual Subscriptions: Rs 1600.00

\$ 300.00

Single Copy : Rs 320.00

\$ 60.00

Payments in respect of subscriptions may be made through NEFT/RTGS payable to NISCAIR, New Delhi.

The details of Bank account for NEFT/ RTGS transactions are as follows:

Bank name : Syndicate Bank Address: Pusa Campus, IARI, New Delhi 110 012, India Branch: Pusa Campus, IARI, New Delhi

Account No.: 90292160000079 Account name: NISCAIR, New Delhi 110 012

IFSC code: SYNB0009029

MICR code : 110025041

Branch code : 9029

SWIFT code: SYNBINBB019

Claims for missing numbers of the journal will be allowed only if received within 3 months of the date of issue of the journal plus the time normally required for postal delivery of the journals and the claim Subscription complaints may be made on Telephone: +91-11-25843359.

© 2019 The Council of Scientific & Industrial Research, New Delhi.