

Materials Forming, Machining and Tribology

Golam Kibria  
B. Bhattacharyya  
J. Paulo Davim *Editors*

# Non-traditional Micromachining Processes

Fundamentals and Applications

 Springer

Golam Kibria · B. Bhattacharyya  
J. Paulo Davim  
Editors

# Non-traditional Micromachining Processes

Fundamentals and Applications

 Springer

*Editors*

Golam Kibria  
Department of Mechanical Engineering  
Aliah University  
Kolkata  
India

J. Paulo Davim  
Department of Mechanical Engineering  
University of Aveiro  
Aveiro  
Portugal

B. Bhattacharyya  
Department of Production Engineering  
Jadavpur University  
Kolkata  
India

ISSN 2195-0911                      ISSN 2195-092X (electronic)  
Materials Forming, Machining and Tribology  
ISBN 978-3-319-52008-7              ISBN 978-3-319-52009-4 (eBook)  
DOI 10.1007/978-3-319-52009-4

Library of Congress Control Number: 2016963424

© Springer International Publishing AG 2017

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature  
The registered company is Springer International Publishing AG  
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

# Contents

<b>1</b>	<b>Non-traditional Micromachining Processes: Opportunities and Challenges</b> .....	<b>1</b>
	S. Debnath, S. Kunar, S.S. Anasane and B. Bhattacharyya	
<b>2</b>	<b>Recent Advancement on Ultrasonic Micro Machining (USMM) Process</b> .....	<b>61</b>
	S. Das, B. Doloi and B. Bhattacharyya	
<b>3</b>	<b>Electrical Discharge Micro-hole Machining Process of Ti-6Al-4V: Improvement of Accuracy and Performance</b> .....	<b>93</b>
	Golam Kibria, I. Shivakoti, B.B. Pradhan and B. Bhattacharyya	
<b>4</b>	<b>Advancements in Micro Wire-cut Electrical Discharge Machining</b> .....	<b>145</b>
	Asit Baran Puri	
<b>5</b>	<b>Laser Micro-turning Process of Aluminium Oxide Ceramic Using Pulsed Nd:YAG Laser</b> .....	<b>179</b>
	Golam Kibria, B. Doloi and B. Bhattacharyya	
<b>6</b>	<b>Fiber Laser Micro-machining of Engineering Materials.</b> .....	<b>227</b>
	A. Sen, B. Doloi and B. Bhattacharyya	
<b>7</b>	<b>Laser Beam Micro-cutting</b> .....	<b>253</b>
	N. Roy, A.S. Kuar and S. Mitra	
<b>8</b>	<b>Electrochemical Micromachining (EMM): Fundamentals and Applications</b> .....	<b>275</b>
	V. Rathod, B. Doloi and B. Bhattacharyya	
<b>9</b>	<b>Electrochemical Micromachining of Titanium and Its Alloys.</b> .....	<b>337</b>
	Sandip S. Anasane and B. Bhattacharyya	

<b>10 Electrochemical Discharge Micro-machining of Engineering Materials</b> .....	367
B.R. Sarkar, B. Doloi and B. Bhattacharyya	
<b>11 Travelling Wire Electrochemical Spark Machining: An Overview</b> .....	393
Anup Malik and Alakesh Manna	
<b>Index</b> .....	413