

1. Record Nr.	UNINA9910830390003321
Titolo	Hybrid micromachining and microfabrication technologies : principles, varieties and applications // edited by Golam Kibria [and three others]
Pubbl/distr/stampa	Hoboken, NJ : , : John Wiley & Sons, Inc. ; Scrivener Publishing LLC, , [2023] ©2023
ISBN	9781394174478 1-394-17494-2
Descrizione fisica	1 online resource (339 pages)
Collana	Innovations in Materials and Manufacturing Series
Soggetti	Micromachining
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover -- Title Page -- Copyright Page -- Contents -- Preface -- Acknowledgement -- Chapter 1 Overview of Hybrid Micromachining and Microfabrication Techniques -- 1.1 Introduction -- 1.2 Classification of Hybrid Micromachining and Microfabrication Techniques -- 1.2.1 Compound Processes -- 1.2.2 Methods Aided by Various Energy Sources -- 1.2.3 Processing Using a Hybrid Tool -- 1.3 Challenges in Hybrid Micromachining -- 1.4 Conclusions -- 1.5 Future Research Opportunities -- References -- Chapter 2 A Review on Experimental Studies in Electrochemical Discharge Machining -- 2.1 Introduction -- 2.2 Historical Background -- 2.3 Principle of Electrochemical Discharge Machining Process -- 2.4 Basic Mechanism of Electrochemical Discharge Machining Process -- 2.5 Application of ECDM Process -- 2.6 Literature Review on ECDM -- 2.6.1 Literature Review on Theoretical Modeling -- 2.6.2 Literature Review on Internal Behavioral Studies -- 2.6.3 Literature Review on Design of ECDM -- 2.6.4 Literature Review on Workpiece Materials Used in ECDM -- 2.6.5 Literature Review on Tooling Materials and Its Design in ECDM -- 2.6.6 Literature Review on Electrolyte Chemicals Used in ECDM -- 2.6.7 Literature Review on Optimization Techniques Used in ECDM -- 2.7 Conclusion -- Acknowledgments -- References -- Chapter 3 Laser-Assisted Micromilling -- 3.1 Introduction -- 3.2 Laser-Assisted

Micromilling -- 3.2.1 Laser-Assisted Micromilling of Steel Alloys -- 3.2.2 Laser-Assisted Micromilling of Titanium Alloys -- 3.2.3 Laser-Assisted Micromilling of Ni Alloys -- 3.2.4 Laser-Assisted Micromilling of Cementite Carbide -- 3.2.5 Laser-Assisted Micromilling of Ceramics -- 3.3 Conclusion -- References -- Chapter 4 Ultrasonic-Assisted Electrochemical Micromachining -- 4.1 Introduction -- 4.2 Ultrasonic Effect -- 4.2.1 Pumping Effect -- 4.2.2 Cavitation Effect -- 4.3 Experimental Procedure.

4.4 Results and Discussion -- 4.4.1 Effect of Traditional Electrochemical Micromachining -- 4.4.2 Effect of Electrolyte Jet During Micropatterning -- 4.4.3 Effect of Ultrasonic Assistance During Micropatterning -- 4.4.4 Effect of Ultrasonic Amplitude During Micropatterning -- 4.4.5 Influence of Working Voltage During Micropatterning -- 4.4.6 Influence of Pulse-Off Time During Micropatterning -- 4.4.7 Influence of Electrode Feed Rate During Micropatterning -- 4.5 Conclusions -- References -- Chapter 5 Micro-Electrochemical Piercing on SS 204 -- 5.1 Introduction -- 5.2 Experimentation on SS 204 Plates With Cu Tool Electrodes -- 5.3 Results and Discussions -- 5.4 Conclusions -- References -- Chapter 6 Laser-Assisted Electrochemical Discharge Micromachining -- 6.1 Introduction -- 6.2 Experimental Procedure -- 6.3 Results and Discussion -- 6.3.1 ECDM Pre-Process -- 6.3.2 Laser Pre-Process -- 6.4 Conclusions -- References -- Chapter 7 Laser-Assisted Hybrid Micromachining Processes and Its Applications -- 7.1 Introduction -- 7.2 Laser-Assisted Hybrid Micromachining -- 7.3 Laser-Assisted Traditional-HMMPs -- 7.3.1 Laser-Assisted Microturning Process -- 7.3.2 Laser-Assisted Microdrilling Process -- 7.3.3 Laser-Assisted Micromilling Process -- 7.3.4 Laser-Assisted Microgrinding Process -- 7.4 Laser-Assisted Nontraditional HMMPs -- 7.4.1 Laser-Assisted Electrodischarge Micromachining -- 7.4.2 Laser-Assisted Electrochemical Micromachining -- 7.4.3 Laser-Assisted Electrochemical Spark Micromachining -- 7.4.4 Laser-Assisted Water Jet Micromachining -- 7.5 Capabilities and Shortfalls of LA-HMMPs -- 7.6 Conclusion -- Acknowledgment -- References -- Chapter 8 Hybrid Laser-Assisted Jet Electrochemical Micromachining Process -- 8.1 Introduction -- 8.2 Overview of Electrochemical Machining -- 8.3 Importance of Electrochemical Micromachining.

8.4 Fundamentals of Electrochemical Micromachining -- 8.4.1 Electrochemistry of Electrochemical Micromachining -- 8.4.2 Mechanism of Material Removal -- 8.5 Major Factors of EMM -- 8.5.1 Nature of Power Supply -- 8.5.2 Interelectrode Gap (IEG) -- 8.5.3 Temperature, Concentration, and Electrolyte Flow -- 8.6 Jet Electrochemical Micromachining -- 8.7 Laser as Assisting Process -- 8.8 Laser-Assisted Jet Electrochemical Micromachining (LA-JECM) -- 8.8.1 Working Principles of LAJECM -- 8.8.2 Mechanism of Material Removal -- 8.8.3 Materials -- 8.8.4 Theoretical and Experimental Method for Process Energy Distribution -- 8.8.5 LAJECM Process Temperature -- 8.8.6 Material Removal Rate and Taper Angle -- 8.8.7 LAJECM and JECM Comparison -- 8.8.8 Machining Precision -- 8.8.8.1 Geometry Precision -- 8.8.8.2 Profile Surface Roughness -- 8.9 Applications of LAJECM -- References -- Chapter 9 Ultrasonic Vibration-Assisted Microwire Electrochemical Discharge Machining -- 9.1 Introduction -- 9.2 Experimental Setup -- 9.3 Results and Discussion -- 9.3.1 Influence of Ultrasonic Amplitude on Micro Slit Width -- 9.3.2 Influence of Voltage on Micro Slit Width -- 9.3.3 Effect of Duty Ratio on Micro Slit Width -- 9.3.4 Influence of Frequency on Slit Width -- 9.3.5 Analysis of Micro Slits -- 9.4 Conclusions -- References -- Chapter 10 Study of Soda-Lime Glass Machinability by Gunmetal

Tool in Electrochemical Discharge Machining and Process Parameters Optimization Using Grey Relational Analysis -- 10.1 Introduction -- 10.2 Experimental Conditions -- 10.3 Analysis of Average MRR of Workpiece (Soda-Lime Glass) Through Gunmetal Electrode -- 10.3.1 ANOVA for Average MRR -- 10.3.2 Influence of Input Factors on Average MRR -- 10.4 Analysis of Average Depth of Machined Hole on Soda-Lime Glass Through Gunmetal Electrode -- 10.4.1 ANOVA for Average Machined Depth. 10.4.2 Influence of Input Factors on Average Machined Depth -- 10.5 Analysis of Average Diameter of Hole of Soda-Lime Glass Through Gunmetal Electrode -- 10.5.1 ANOVA for Average Hole Diameter -- 10.5.2 Influence of Input Factors on Average Hole Diameter -- 10.6 Grey Relational Analysis Optimization of Soda-Lime Glass Results by Gunmetal Electrode -- 10.6.1 Methodology of Grey Relational Analysis -- 10.6.2 Data Pre-Processing -- 10.6.3 Grey Relational Generating -- 10.6.4 Deviation Sequence -- 10.6.5 Grey Relational Coefficient -- 10.6.6 Grey Relational Grade -- 10.7 Conclusion -- Acknowledgments -- References -- Chapter 11 Micro Turbine Generator Combined with Silicon Structure and Ceramic Magnetic Circuit -- 11.1 Introduction -- 11.2 Concept -- 11.3 Fabrication Technology -- 11.3.1 Microfabrication Technology of Silicon Material -- 11.3.2 Multilayer Ceramic Technology -- 11.4 Designs and Experiments -- 11.4.1 Designs of Turbine and Magnetic Circuit for Single-Phase Type -- 11.4.2 Designs of Turbine and Magnetic Circuit for Three-Phase Type -- 11.4.3 Rotational Experiment and Rotor Blade Design -- 11.4.4 Low Boiling Point Fluid and Experiment -- 11.5 Results and Discussion -- 11.5.1 Fabricated Evaluation -- 11.5.2 Rotational Result -- 11.5.3 Comparison of Rotor Shape and Rotational Motion -- 11.5.4 Phase Change -- 11.6 Conclusions -- Acknowledgment -- References -- Chapter 12 A Review on Hybrid Micromachining Process and Technologies -- 12.1 Introduction -- 12.2 Characteristics of Hybrid-Micromachining -- 12.3 Bibliometric Survey of Micromachining to Hybrid-Micromachining -- 12.4 Material Removal in Microsized -- 12.5 Nontraditional Hybrid-Micromachining Technologies -- 12.6 Classification of Techniques Used for Micromachining to Hybrid-Micromachining -- 12.6.1 Classification According to Material Removal Hybrid-Micromachining Phenomena. 12.6.2 Classification According to Categories Based on Material Removal Accuracy -- 12.6.3 Classification According to Hybrid-Micromachining Purposes -- 12.6.4 Classification of Hybrid Micromanufacturing Processes -- 12.7 Materials Are Used and Application of Hybrid-Micromachining -- 12.8 Conclusions -- References -- Chapter 13 Material Removal in Spark-Assisted Chemical Engraving for Micromachining -- 13.1 Introduction -- 13.2 Essentials of SACE -- 13.2.1 Instances of SACE Micromachining -- 13.3 Genesis of SACE Acronym: A Brief Historical Survey -- 13.4 SACE: A Viable Micromachining Technology -- 13.4.1 Mechanical -Machining Techniques -- 13.4.2 Chemical -Machining Methods -- 13.4.3 Thermal -Machining Methods -- 13.5 Material Removal Mechanism in SACE -Machining -- 13.5.1 General Aspects -- 13.5.2 Micromachining at Shallow Depths -- 13.5.3 Micromachining at High Depths -- 13.5.4 Micromachining by Chemical Reaction -- 13.6 SACE -Machining Process Control -- 13.6.1 Analysis of Process -- 13.6.2 Etch Promotion -- 13.7 Conclusion and Scope for Future Work -- References -- Index -- EULA.

well as future directions, providing researchers and engineers who work in hybrid micromachining with a much-appreciated orientation. The book is dedicated to advanced hybrid micromachining and microfabrication technologies by detailing principals, techniques, processes, conditions, research advances, research challenges, and opportunities for various types of advanced hybrid micromachining and microfabrication. It discusses the mechanisms of material removal supported by experimental validation. Constructional features of hybrid micromachining setup suitable for industrial micromachining applications are explained. Separate chapters are devoted to different advanced hybrid micromachining and microfabrication to design and development of micro-tools, which is one of the most vital components in advanced hybrid micromachining, and which can also be used for various micro and nano applications. Power supply, and other major factors which influence advanced hybrid micromachining processes, are covered and research findings concerning the improvement of machining accuracy and efficiency are reported.
