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| **Title:** | Recent progress of micromanufacturing technology | | |
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| **Published Journal Name:** | Proceedings of the 7th Bangladeshi International Conference on Industrial Engineering and Operations Management (IEOM), Dhaka, Bangladesh | | |
| **Type of Publication:** | International Conference | | |
| **Volume:** |  | Issue |  |
| **Publisher:** | IEOM | | |
| **Publication Date:** | Dec 21-22, 2024 | | |
| **ISSN:** | 2169-8767 | | |
| **DOI:** |  | | |
| **URL:** | https://ieomsociety.org/bangladesh2024/ | | |
| **Other Related Info.:** | Page ID 174 | | |
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| **Abstract:** |  |
| Micromanufacturing technologies have emerged as critical enablers for the production of miniature components and devices, driving innovation across various high-tech industries. This paper provides a comprehensive review of recent advancements in micromanufacturing, categorized into key areas: micromachining, hybrid micromachining, thermal micromachining, chemical and electrochemical micromanufacturing, microcasting, microforming, microassembly, microprinting, additive micromanufacturing, and advanced micromanufacturing. The study delves into conventional mechanical micromachining processes such as milling, drilling, and turning, alongside advanced techniques including laser micromachining, Electro Discharge Machining, Ultrasonic Machining, and Ion Beam Machining. It also explores hybrid micromachining methods like LIGA, Micro-EDM, Micro-Abrasive Jet Machining, Field Emission Machining, Focused Ion Beam, and Atomic Force Microscopy. Thermal micromachining processes are examined for their unique capabilities in shaping materials at the micro-scale. The paper further investigates chemical and electrochemical micromanufacturing techniques such as electrodeposition, photolithography, etching, Chemical Vapor Deposition, Atomic Layer Deposition, Electrochemical Machining, and electrochemical etching. Additionally, the review covers microcasting and microforming processes adapted for micro-scale production. Microassembly techniques, both manual and automated, are discussed, along with microprinting and additive micromanufacturing methods like inkjet printing, laser printing, and 3D printing. An extensive comparative analysis has been performed with an exploration of advanced micromanufacturing techniques, highlighting the latest research and developments that are pushing the boundaries of micro-scale production. The paper underscores the critical role of micromanufacturing in the development of next-generation technologies and its potential for revolutionizing numerous sectors. | |