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Daud, N.D.[a] , Hasan, M.N.[a] , Saleh, T.[b] , Leow, P.L.[a] , Mohamed Ali, M.S.[a]

Non-traditional machining techniques for silicon wafers
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[a] School of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, Johor, Johor Bahru, 81310, Malaysia
[b] Department of Mechatronics Engineering, Kulliyyah of Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, 53100, Malaysia

Abstract
Silicon (Si) micromachining techniques have recently witnessed significant advancement, attributable to the high surge in demand for microelectromechanical and microelectronic devices. Micromachining techniques are widely used to cut or pattern Si, in order to obtain high-quality surface finishes for the fabrication of devices. Micromachining techniques are used for the fabrication of three-dimensional (3D) microstructures for microelectromechanical devices. In this work, the capabilities and competencies of non-traditional Si micromachining techniques, including ultrasonic, ion beam milling, laser machining, and electrical discharge machining, are discussed and compared accordingly. The working principles, advantages, limitations, and Si microstructures that have been fabricated before are discussed in detail. Additionally, this work covers the performance reported by multiple researchers on these micromachining methods, spanning the temporal range of 1990 to 2020. The key outcomes of this study are explored and summarized. © 2022, The Author(s), under exclusive licence to Springer-Verlag London Ltd., part of Springer Nature.

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Electrical discharge; Ion beam; Laser; Machining performances; Micromachining; Silicon; Ultrasonic

Index Keywords
Composite micromechanics, Electric discharge machining, Ion beams, Microelectronics, Micromachining, Microstructure, Silicon wafers; Electrical discharges, High quality surface, Machining performance, Machining techniques, Micro-electro-mechanical, Micro-electronic devices, Micromachining techniques, Non-traditional machining, Silicon micromachining, Surface finishes; Electric discharges

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Correspondence Address
Mohamed Ali M.S.; School of Electrical Engineering, Johor, Malaysia; email: sultan_ali@fke.utm.my

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