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## State-of-art review of past research on manufacturing of meso and micro cylindrical gears

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### Research Highlights

- Critical review of past research on manufacturing of meso and micro cylindrical gears
- Reveals use of different micro-manufacturing and advanced machining processes
- Highlights gear specifications and materials and major achievements of past research
- Review summarized in tabular form for quick and easy future referencing
- Defines future research directions on manufacturing of meso and micro cylindrical gears

**Abstract:** Meso and micro-gears are the key elements of various micro-systems and devices used for transmitting power and/or motion due to their ultra-light weight, smaller size and compact, higher dimensional accuracy, better functional and operating characteristics, longer service life, zero backlash and ability to sustain their performance under risky ecological environments. Continuously growing demands for the micro-systems and miniaturized components have accelerated requirement of manufacturing high quality meso and micro gears productively and economically from a variety of materials. This has motivated researchers to explore existing processes and develop alternative net-shape or near net-shape processes to fulfill this demand. This paper presents state-of-art review of the past research work carried out on manufacturing of meso and micro spur and helical gears highlighting their material, specifications, type of manufacturing processes used, their capabilities and limitations. It reveals that (i) most of the past work has focused on manufacturing of meso and micro spur gear using various micro-manufacturing processes which yield poor quality; (ii) some work has been reported on using advanced machining processes to manufacture of near-net shaped meso and micro spur gears of high quality standard; (iii) only powder extrusion has been explored for manufacturing the meso and micro helical gears; (iv) no work has been reported on (a) meso and micro helical gears manufacturing either by micro-manufacturing or advanced machining processes; (b) manufacturing of meso and micro conical gears, internal gears and

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