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Microfluidic viscometers for biochemical and biomedical applications: A review

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Abstract

In recent times, microviscometers have been exploited for widespread and diverse detection applications such as sensing adulteration in various fluids used in day-to-day life, diagnostics in the biomedical domain involving human bodily fluids, pharmaceuticals, and biochemical analysis. The microviscometers have the proven capability for being employed as point-of-care devices, which can be achieved by automating them by integrating various microelectronic components, such as integrated circuits, and sensors, on printed circuit boards. In the past few decades, several fabrication techniques have been reported to measure relative viscosity in the microfluidic domain. Moreover, considerable innovation in this direction has observed a lot of improvements and advancements leading to the reduction of cost, and size. Also, the microfluidic viscometer provides simple and rapid detection which makes them more flexible and versatile in the biomedical domain. The microfluidic device unveils numerous features such as easy-to-use, portable, transparency in operation, and rapid detection with a marginal reaction volume. In this review, the development of various microfluidic-based viscometers and their applications, primarily in biomedical applications, have been discussed. Using the state-of-art approach, such microviscometers can be manufactured on a commercial scale for point-of-care diagnosis. This review summarizes the limitations in conventional viscometers and value-chain, comprising designs, fabrication techniques, and other related methodologies, to develop the microviscometers that have been presented. It has been observed that the interest in microfluidic-based viscometers has incredible applications for regular monitoring and personalized point-of-care devices in a controlled and selective manner.

Key words:
Grid-tied, single-phase, neutral point clamp, leakage current.

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