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A Disposable Impedance-based Sensor for In-line Cell Growth Monitoring in CAR-T Cell Manufacturing

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Abstract

This paper presents the development of low-cost, disposable impedance-based sensors for real-time, in-line monitoring of suspension cell culture. The sensors consist of electrical discharge machining (EDM) cut aluminum electrodes and polydimethylsiloxane (PDMS) spacers, low-cost materials that can be safely disposed of. Our work testifies the capability of the low-cost sensors for in-line, non-invasive monitoring for suspension cell growth in cell manufacturing. A hybrid equivalent circuit model extracts key features/parameters from intertwined impedance signals and feeds them to a novel physics-inspired model designed for low-frequency dielectric dispersion (LFDD) to decide viable cell count (VCC), a critical quality attribute (CQA) in cell manufacturing. Predicted VCC trends are then compared with image-based cell count data to verify their accuracy.

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