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MEMS biosensor for monitoring water toxicity based on quartz crystal microbalance (Article)

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Abstract

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This paper presents the use of a commercial quartz crystal microbalance (QCM) to investigate live-cell activity in water-based toxic solutions. The QCM used in this research has a resonant frequency of 10 MHz and consists of an AT-cut quartz crystal with gold electrodes on both sides. This QCM was transformed into a functional biosensor by integrating with polydimethylsiloxane culturing chambers. Rainbow trout gill epithelial cells were cultured on the resonators as a sensorial layer. The fluctuation of the resonant frequency, due to the change of cell morphology and adhesion, is an indicator of water toxicity. The shift in the resonant frequency provides information about the viability of the cells after exposure to toxicants. The toxicity result shows distinct responses after exposing cells to 0.526 μM of pentachlorophenol (PCP) solution, which is the Military Exposure Guidelines concentration. This research demonstrated that the QCM is sensitive to a low concentration of PCP and no further modification of the QCM surface was required. © 2020 Author(s).

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