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Stability Enhanced, Repeatability Improved Parylene-C Passivated on QCM Sensor for aPTT Measurement

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Abstract

Determination of blood clotting time is essential in monitoring therapeutic anticoagulants. In this work, Parylene-C passivated on quartz crystal microbalance (P-QCM) was developed for the activated partial thromboplastin time (aPTT) measurement. Compared with typical QCM, P-QCM possessed a hydrophobic surface and sensitive frequency response to viscoelastic variations on electrode surface. Fibrin could be adsorbed effectively, due to the hydrophobicity of the P-QCM surface. Comparing with typical QCM, the peak-to-peak value (PPV) of P-QCM was increased by $1.94\% \pm 0.63\%$, which indicated enhancement of signal-to-noise ratio. For P-QCM, the coefficient of variation (CV) of frequency decrease and aPTT were 2.58% and 1.24% separately, which demonstrated improvement of stability and reproducibility. Moreover, compared with SYSMEX CS 2000i haematology analyzer, clinical coefficient index (R^2) was 0.983. In conclusion, P-QCM exhibited potential for improving stability, reproducibility and linearity of piezoelectric sensors, and might be more promising for point of care testing (POCT) applications.

Keywords: P-QCM, aPTT, peak-to-peak value, stability, linearity

¹ These authors contributed equally to this work and should be considered co-first authors

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