

Immunoassay of Human Immunoglobulin Using Quartz Crystal Microbalance

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Summary

We performed an immunoassay analysis using the Quartz Crystal Microbalance (QCM) biosensor to detect the specific binding reaction of the (Human IgG1)-(Anti-Human IgG1) protein pair. Both experimental and computational were used to study biomolecular binding reactions in microfluidic channels. We discussed the unsteady convective diffusion in the transportation tube and found that the distribution of the analyte concentration in the tube is strongly affected by the flow field. Due to this, large discrepancies between the simulations and experimental results were observed. We show that the conventional assumption of the uniform and steady analyte concentration used in the computational procedure is not accurate enough. In addition, we show that the commonly used procedure in kinetic analysis for estimating binding rate constants from the experimental data would underestimate these rate constants due to neglected diffusion processes from the inlet to the reaction surface. A modified procedure is proposed to supplement the kinetic analysis, thus yielding better consistency with experiments.

