Hydrogel-Assisted Signal Enhancement in Lateral Flow Assays

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Over the years, point-of-need testing has shown great potential for replacing traditional methods in healthcare, food safety, and environmental monitoring. The need for these platforms has been strongly emphasized during the COVID-19 epidemic for saving lives while enabling fast decision-making at low cost.[1] The user-friendly and portable design allows the monitoring of target analytes within minutes. Lateral flow assays (LFAs) are one of the most popular on-site testing tools for enabling fast and accurate results based on paper without the need for special equipment.[2] These platforms are lightweight, disposable, and user-friendly compared to conventional laboratory-based methods that are commonly used for detecting biomarkers in complex biological samples, allergens, toxins, and pathogens to improve food safety. In this work, we present a point-of-need biosensing platform based on hydrogel-integrated LFAs to improve sensor performance by controlling the flow and filtering the biological sample. Hydrogels are hydrophilic polymeric networks that have been used in many biomedical applications thanks to their physicochemical characteristics.[3] The nanoporous hydrogels allow size-selective filtration of biomolecules in the LFA and control the flow rate of sample for increased antibody-analyte binding time. Therefore, various hydrogels integrated into nitrocellulose to enhance the sensor performance have been investigated. The structure of the hydrogel in the nitrocellulose was characterized by SEM, confocal microscopy and filtering tests with analytes of known sizes.

References

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