

Rapid multiplexed colorimetric detection of microRNAs based on encoded hydrogel microparticles

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With increasing interest in microRNA (miRNA) detection at practical sites, colorimetric assays have garnered much attention as they enable simple analysis with portable devices regardless of the sites. The encoded hydrogel microparticle-based colorimetric miRNA assay is considered as a promising technique, owing to its strengths, including large multiplex capacity and high sensitivity. However, it places a limitation on the assay time, particularly the colorimetric reaction time, which is too long, making the practical application difficult. In this work, we present an encoded particles-based rapid colorimetric assay, which exhibits a significant decrease in the colorimetric reaction time by two factors: 1) an increase in the number of enzymes bound to hydrogel microparticles via a post-synthesis functionalization method, and 2) an elevation in the enzyme reaction temperature during colorimetric labeling. We obtained a comparable sensitivity of the colorimetric assay even with a shortened colorimetric reaction time. Furthermore, we validated that our colorimetric detection method is suitable for multiplex miRNA detection, due to its low cross-reactivity.