

Simultaneous determination of nitrate and nitrite using membraneless gas-separation microfluidic paper-based analytical device

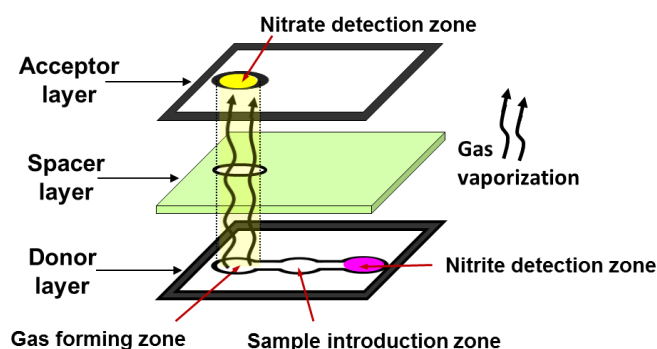
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In this work, we are developing a method of simultaneous detection of nitrate and nitrite by using a ‘membraneless gas-separation microfluidic paper-based analytical device (MBL-GS- μ PAD)’. The device consists of three layers including donor, acceptor and a spacer. Donor and acceptor layers are made of filter paper. The spacer is pre-punched double-sided adhesive foam tape. Donor layer has three reservoirs. After loading the sample is loaded onto the middle reservoir, sample flows into two directions to the other two adjacent reservoirs. On one side, nitrite is detected with Griess reagent pre-deposited on the detection zone. In the other reservoir located on the opposite side, nitrate reacts with pre-deposited NaOH and Al powder yielding NH_3 gas. NH_3 diffuses through the spacer’s tunnel and reacts with immobilized Nessler reagent in the reservoir of the acceptor layer giving yellowish brown product. Photos of both colored products formed on detection zones were taken by a digital camera. Color intensities of the photos were obtained by ImageJ. According to the preliminary results the obtained calibration equations were $y=(0.027\pm 0.002)[\text{NO}_3^-] + (177.285\pm 1.457)$, $r^2=0.977$ and were $y=(2.330\pm 0.368)[\text{NO}_2^-] + (189.412\pm 6.195)$, $r^2=0.909$ for nitrate and nitrite, respectively.



Keywords: Nitrate, Nitrite, Membraneless gas-separation microfluidic paper-based analytical device