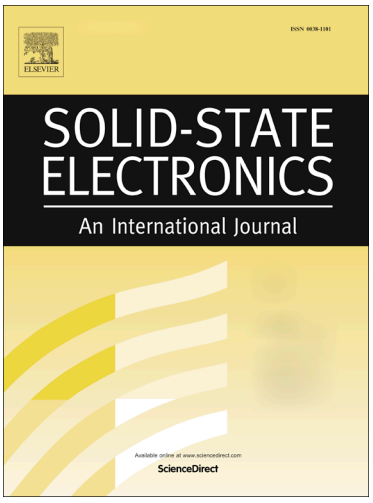

Sensing properties of separative paper-based extended-gate ion-sensitive field-effect transistor for cost effective pH sensor applications

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Sensing properties of separative paper-based extended-gate ion-sensitive field-effect transistor for cost effective pH sensor applications

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In this study, we developed a cost-effective ion-sensing field-effect transistor (FET) with an extended gate (EG) fabricated on a separative paper substrate. The pH sensing characteristics of the paper EG was compared with those of other EGs fabricated on silicon, glass, or polyimide substrates. The fabricated paper-based EGFET exhibited excellent sensitivity close to the Nernst response limit as well as to that of the other substrate-based EGFETs. In addition, we found that all EGFETs, regardless of the substrate, have similar non-ideal behavior, i.e., drift phenomenon and hysteresis width. To investigate the degradation and durability of the paper EG after prolonged use, aging-effect tests were carried out in terms of the hysteresis width and sensitivity over a course of 30 days. As a result, the paper EG maintained stable pH sensing characteristics after 30 days. Therefore, we expect that paper EGFETs can provide a cost-effective sensor platform.

Keywords: ion-sensitive field effect transistor, extended gate, paper substrate

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