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Graphene Chemical sensors on Flexible Substrates BENJAMIN MAILLY, ALLEN HSU, Massachusetts Institute of Technology, FRANCESCO PAPPALARDO, STMicroelectronics, DAWN NIDA, NSRDEC, ELIO GUIDETTI, LUIGI OCCHIPINTI, SALVATORE COFFA, STMicroelectronics, JING KONG, TOMAS PALACIOS, Massachusetts Institute of Technology, TOMAS PALACIOS TEAM — Thanks to its all-surface 2D structure combined with a very high carrier mobility, Graphene is a very promising candidate for high sensitivity and low noise chemical sensing. Indeed, graphene devices can perform electrical detection for chemical sensing in a wide variety of applications, including pH monitoring in electrolytes and glucose measurements in blood. Furthermore, the fabrication of low cost and flexible sensors can be made possible by enabling the integration of graphene on plastic substrates. Our group has developed the first solution-gated graphene field effect transistor (SGFET) on a flexible substrate, PolyEthylene Naphthalate (PEN). For this purpose, graphene grown by chemical vapor deposition is transferred on the PEN substrate, where the metal contacts had already been evaporated. The characterization of our devices in a phosphate buffer solution displays good transconductance around 0.9 mS.mm^{-1}. pH measurements have been performed using these devices and a sensitivity as high as 22 mV/pH have been demonstrated. In addition, long term pH monitoring was demonstrated in these devices. Our on-going work focuses on studying the influence of the substrate as well as the presence of residues on the graphene surface in the pH sensing mechanism.

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