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Reduced Graphene Oxide Field-effect Transistor as a Transducer for Ion Sensing Application

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Recently, graphene and graphene-based materials such as graphene oxide (GO) or reduced graphene oxide (R-GO) draws a great attention for electronic devices due to their structures of one atomic layer of carbon hexagon that have excellent mechanical, electrical, thermal, optical properties and very high specific surface area that can be high potential for chemical functionalization. R-GO is a promising candidate because it can be prepared with low-cost from solution process by chemical oxidation and exfoliation using strong acids and oxidants to produce graphene oxide (GO) and its subsequent reduction. R-GO has been used as semiconductor or conductor materials as well as sensing layer for bio-molecules or ions. In this work, reduced graphene oxide field-effect transistor (R-GO FET) has been fabricated with ITO extended gate structure that has sensing area on ITO extended gate part. R-GO FET device was encapsulated by tetratetracontane (TTC) layer using thermal evaporation. A thermal annealing process was carried out at 140°C for 4 hours in the same thermal vacuum chamber to remove defects in R-GO film before deposition of TTC at 50°C with thickness of 200 nm. As a result of this process, R-GO FET device has a very high stability and durability for months to serve as a transducer for sensing applications.

Keywords: Reduced graphene oxide (R-GO), Tetratetracontane (TTC), ITO