Graphene paper as a new form of graphene-supported nanomaterials has received worldwide attention since its first report in 2007. Due to their high flexibility, lightweight and good electrical conductivity, graphene papers have demonstrated the promising potential for crucial applications in electrochemical sensors and energy technologies among others. In this chapter, we present some examples to overview recent advances in the research and development of two-dimensional (2D) graphene papers as new materials for electrochemical sensors. The chapter covers the design, fabrication, functionalization and application evaluations of graphene papers. We first summarize the mainstream methods for fabrication of graphene papers/membranes, with the focus on chemical vapor deposition techniques and solution-processing assembly approaches. A large portion of this chapter is then devoted to the highlights of specific functionalization of graphene papers with polymer and nanoscale functional building blocks for electrochemical-sensing purposes. In terms of electrochemical-sensing applications, the emphasis is on enzyme-graphene and nanoparticle-graphene paper-based systems for the detection of glucose. We finally conclude this chapter with brief remarks and outlook.

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