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Scalable Fabrication of Monolithic Micro-Supercapacitors with Tailored Geometries for On-Chip Energy Storage

Abstract

Single-step scalable fabrication of micro-supercapacitors (MSCs) with both high energy and power densities is still challenging. To address this, we demonstrate the scalable fabrication of graphene-based monolithic MSCs with diverse planar geometries and capable of superior integration by photochemical reduction of graphene oxide/TiO_2 nanoparticle hybrid films. The resulting monolithic MSCs can operate well in a hydrophobic electrolyte of ionic liquid (3.0 V) at a high scan rate of 200 V s^{-1}, two orders of magnitude higher than those of conventional supercapacitors. More notably, the MSCs show landmark volumetric power density of 534 W cm^{-3} and energy density of 13.2 mWh cm^{-3}, both of which are among the highest values attained for carbon-based MSCs. Therefore, such monolithic MSC devices based on photochemically reduced, compact graphene films possess enormous potential for numerous miniaturized, flexible electronic applications.

References

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Figures

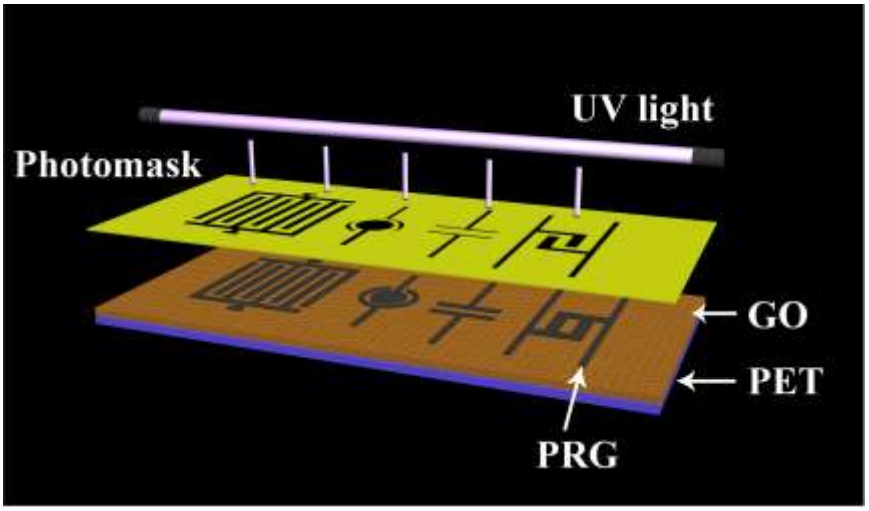

Figure 1: Scheme of fabricating PRG-MSCs with various tailored planar geometries.