Dual-functional single stranded deoxyribonucleic acid for graphene oxide reduction and charge storage enhancement

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ABSTRACT

This study reports a one-step process to produce single-stranded deoxyribonucleic acid (ssDNA) functionalized reduced graphene oxide (ssDNA/rGO). The ssDNA acts as a reducing agent for the reduction of GO into rGO and simultaneously performs functionalization onto rGO, which is confirmed by spectroscopic and microscopic analyses. Such reduction capability is not being observed in double-stranded DNA (dsDNA). The high charge density of ssDNA on rGO is investigated for its application in electrochemical supercapacitor, and it is revealed that the ssDNA/rGO exhibits a specific capacitance of 129 F g^{-1} with high stability (92%) up to 10,000 cycles. The findings open the gateway to develop a biomolecule-based energy storage system.

KEYWORDS

Bioelectronics; DNA; Supercapacitor; Green reduction; Graphene

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