Characterizations

Ink rheology: Rheological properties of the ink were measured by using a stress controlled DHR-2 rheometer (TA Instruments) with a 20 mm steel flat plate geometry. The apparent viscosity of ink was carried out at an angular frequency from $10^{-1}$ to $10^{2}$ s$^{-1}$. The storage ($G'$) and loss ($G''$) moduli of inks as a function of shear stress from $10^{-1}$ to $\sim10^{3}$ Pa were obtained at a constant frequency of 1 Hz. Oscillatory time sweep with a constant shear rate of 1 Hz for 3 h was also carried out to demonstrate the structural stability of SnO$_2$ QDs/GO ink.

3D printing: First, as-prepared ink was loaded into a 3 mL syringes and extruded through a needle with a diameter of 200 $\mu$m by air pressure, provided by an air-powered fluid dispenser (DSP501N, Fisnar). The SnO$_2$ quantum dots/graphene (3DP-SnO$_2$ QDs/G) architectures were printed onto a substrate controlled by a benchtop robot (Fisnar F4200n) with a pre-editing program of micro-lattices, which were designed with a center-to-center rods spacing (L) of 800 $\mu$m and a rod diameter (d) of 200 $\mu$m. The optimal extrusion pressure and move speed of nozzle were 60 psi and 8 mm s$^{-1}$. Subsequently, the printed architectures were freeze-dried to remove the solvent and solidify the structure. Finally, a gas-based hydrazine hydrate reduction was implemented to reduce the GO.
Fig. S1. TEM and HRTEM images of the SnO$_2$ QDs.

Fig. S2. XRD patterns of 3DP-SnO$_2$ QDs/G and pure SnO$_2$ QDs. The pure SnO$_2$ QDs and 3DP-SnO$_2$ QDs/G shows the same characteristic peaks, which are indexed as tetragonal rutile-like SnO$_2$, confirming the presence of SnO$_2$ in our printed architectures.
**Fig. S3.** a) AFM image of the SnO$_2$ QDs. b,c) Height analysis of the SnO$_2$ QDs along the blue and red line in a).

**Fig. S4.** a) TEM and b) HRTEM images of SnO$_2$ QDs obtained in the absence of NH$_4$Cl.
Fig. S5. Digital images of the controllable sol-gel approach in the absence of SnCl$_4$. Only three-dimensional NH$_4$Cl framework obtained after the freeze-drying process, and it decomposed after heat treatment.

Fig. S6. a) XPS and b) high resolution Sn 3d and O 1s spectra of SnO$_2$ QDs.
Fig. S7. a) The nitrogen adsorption-desorption isotherm and b) pore size distribution of SnO$_2$ QDs.

Fig. S8. Photos of 3DP-SnO$_2$ QDs/G architectures.
**Fig. S9.** Typical CV curves of 3DP-SnO$_2$ QDs/G architectures at a scan rate of 0.1 mV s$^{-1}$. Two pairs of dominant redox peaks at 0.03 and 0.58 V, 1.05 V and 1.3 V are attributed to the alloy and dealloy of Sn metal and transformation between SnO$_2$ and Sn, respectively.

**Fig. S10.** Electrochemical impedance spectra (EIS) of 3DP-SnO$_2$ QDs/G, SnO$_2$ QDs/G and SnO$_2$ QDs.
**Fig. S11.** The equivalent circuit diagram used for fitting the EIS profiles of 3DP-SnO$_2$ QDs/G, SnO$_2$ QDs/G and SnO$_2$ QDs. ($R_1$: the resistance of electrolyte; $R_2$: the resistance of the surface film formed on the electrodes; $R_3$: the charge-transfer resistance; $CPE_1$, $CPE_2$: constant phase element; $W_1$: Warburg element)

**Fig. S12.** Cycle performances of 3DP-SnO$_2$ QDs/G architectures at a current density of 1A g$^{-1}$. A stable specific capacity of 187.4 mAh g$^{-1}$ can be retained after 100 cycles.
Fig. S13. Comparison of CV curves of 3DP-SnO$_2$ QDs/G architectures with different printed layers.

Fig. S14. The specific capacities of 2-layer, 4-layer and 6-layer 3DP-SnO$_2$ QDs/G architectures. The 3DP-SnO$_2$ QDs/G with 6 layers shows slightly lower specific capacities than the samples with 2 layers and 4 layers.

Table S1. Kinetics parameters of 3DP-SnO$_2$ QDs/G, SnO$_2$ QDs/G and SnO$_2$ QDs architectures.
<table>
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