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# Synthesis, characterization and supercapacitive application of nanocauliflower-like cobalt tungstate thin films by successive ionic layer adsorption and reaction (SILAR) method

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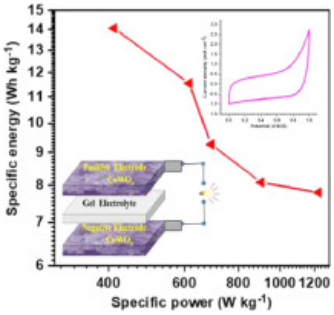
## Abstract

For the first time, cobalt tungstate ($CoWO_4$) thin films were synthesized by successive ionic layer adsorption and reaction (SILAR) method. The monoclinic crystal structure of $CoWO_4$ film was confirmed from X-ray diffraction (XRD) technique. The elemental, surface morphological, structural, and electrical analyses were executed using Fourier transform infrared spectroscopy (FT-IR), field emission scanning electron microscopy (FE-SEM), energy dispersive X-ray analysis (EDAX), X-ray photoelectron spectroscopy (XPS), Brunauer-Emmett-Teller (BET), two point probe method, and contact angle measurement techniques. The surface morphology of $CoWO_4$ thin film consisted of islands of agglomerated cauliflower-like spherical nanoparticles with hydrophilic nature. The specific surface area of 60 $m^2\ g^{-1}$ with an average pore size of 1.10 nm. The $CoWO_4$ thin film electrode exhibited specific capacitance of 1436.5 F $g^{-1}$ at a scan rate of 2 mV $s^{-1}$ in 1 M KOH as well as capacitance retention of 94% over 3000 galvanostatic charge discharge (GCD) cycles. Furthermore, flexible solid-state symmetric supercapacitor (FSS-SSC) device assembled using $CoWO_4$ thin films, showed specific capacitance of 101.32 F $g^{-1}$, specific energy of 14.07 Wh $kg^{-1}$ and specific power of 1225.25 W $kg^{-1}$. This work highlights simplistic preparation of $CoWO_4$ thin films for energy storage application.

## Graphical abstract

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