

Electronic Supplementary Information (ESI)

Langmuir-Blodgett self organized nanocrystalline tungsten oxide thin films for electrochromic performance

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S1. Surface pressure area (π -A) isotherm

Fig. S1 display the surface pressure–area (π -A) isotherm for ODA on 10^{-4} M aqueous solution of sodium tungstate at room temperature.

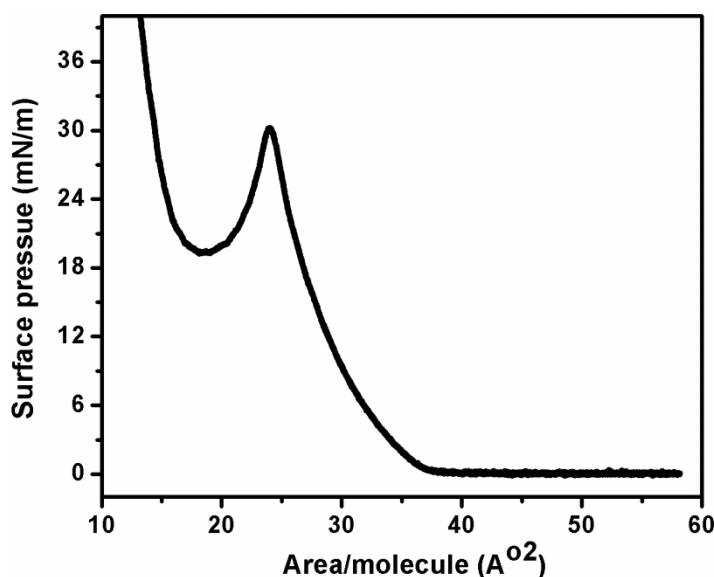


Fig. S1 Surface pressure-area isotherm of ODA molecule on 10^{-4} M sodium tungstate solution.

The isotherm shows slow and continuous compression of monolayer with recording surface pressure. At the large surface area, monolayer behaves as a gas and molecules are way

from each other. It shows the very weak interaction of ODA and WO_4^{2-} ions. At this stage the surface pressure is less as 1 mN m^{-1} . When the area is sufficiently reduced (below 36 \AA^2) by the compression, ODA starts interact with WO_4^{2-} ions to form the octadecylamine-tungsten complex so called liquid state and isotherm becomes a stepper. Further compression was performed to form solid crystalline state (steepest part of the isotherm) in which molecules are closed packed and vertically oriented at the air-water interface (up to 30 mN m^{-1}). Area per molecule estimated is 31 \AA^2 by extrapolating the steepest part of the isotherm at zero surface pressure. If monolayer is further compressed beyond the crystalline state, surface pressure decreases indicating the collapse of monolayer. The deposition pressure was chosen to be 15 mN m^{-1} and multilayer LB films of ODA-tungstate were deposited at 15 mN m^{-1} .

S2 Field emission scanning electron microscopy (FESEM)

The low magnified FESEM image (Fig S2a) reveals the overall surface covered with small circle which look like created after bubble breaking. These circles may be due to decomposition of octadecylamine at high heating (5°C min^{-1}) rate during the decomposition of octadecylamine-tungsten complex. High magnified FESEM image Fig. S2b display the small surface trap which may created due to high heating rate but film surface was 100% covered with WO_3 nanoparticles.

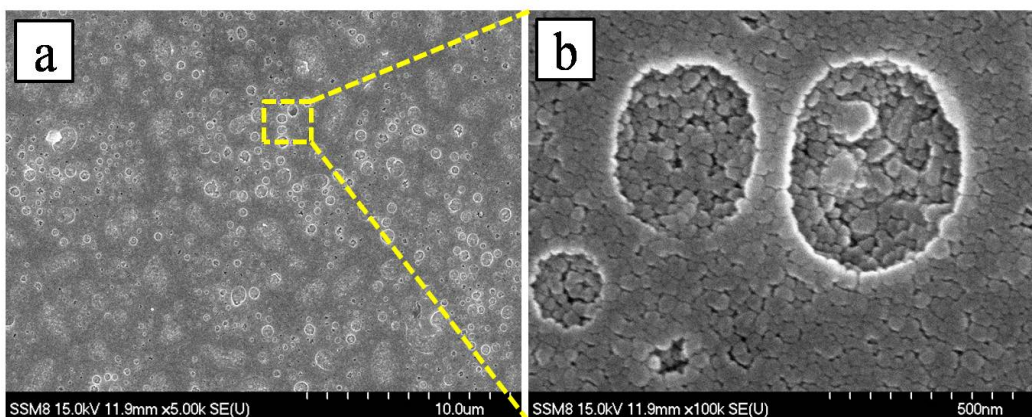


Fig. S2 FESEM images of WO_3 thin film at (a) low and (b) high magnification

S3 Optical reflectance

Optical reflectance measurements were carried out in the wavelength range 350-850 nm using Spectroscopic Reflectometer Steller Net Inc., USA.

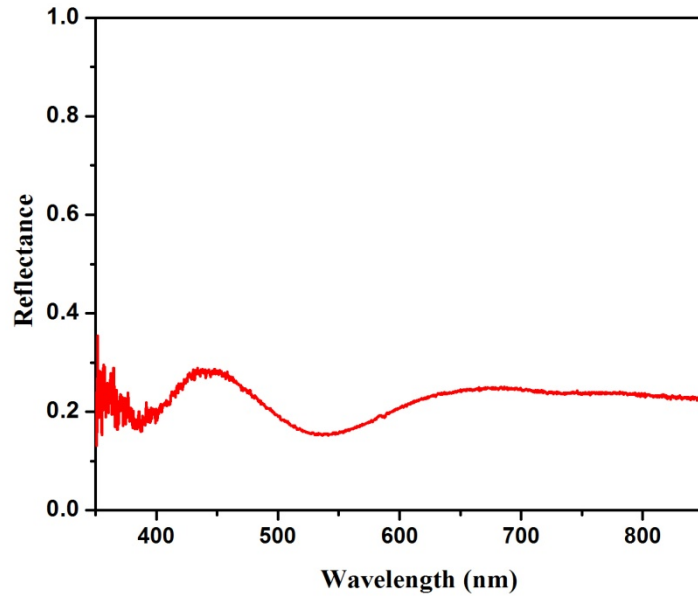


Fig.S3 Optical reflectance spectra of WO₃ thin film.