# Flame Syntheised Nanostructured $WO_3$ Thin Films for Photoelectrochemical Application

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Tungsten oxide is one of the most widely studied semiconductor material as photoanode for photoelectrochemcial water-splitting techonologies due to its favorable intrinsic electrochemical properties. One-dimentional (1D) nanustructured tungsten oxide has shown great potential for this application. We prepared the 1-D nanotube and nanoflower structured tungsten oxide on fluorine-doped tin oxide (FTO) glass by a simple three-step approach. Firstly, a seed layer was coated on FTO glass by spin coating. Secondly, a simple, rapid aerosol flame deposition method was utilized to fabricate 1-D $W_{18}O_{49}$ thin film, in which the tungsten wire was evaporated and oxidized in a fuel-rich flame to produce tungsten oxide vapors and to be condensed onto a colder FTO glass substrate. Followed by annealing process, these 1-D $W_{18}O_{49}$ thin films could be converted to 1-D nanostructured $WO_3$ thin films. The morphology difference of thin films with or without seed layer was compared. Thin films structure properties were characterized by SEM, XRD and TEM. The photoelectrochemical properties of the assembled thin films with distinct morphologies were tested by IPCE measurement system.