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Supporting Information

Enhanced Visible-Light Photoelectrochemical Behaviour of Heterojunction Composite with Cu_2O Nanoparticles-Decorated TiO_2 Nanotube Arrays

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The composition of Cu_2O/TiO_2 nanotube electrodes before and after applying 0.5 V have been analyzed using XRD. From the XRD patterns shown in Fig. S1, it is clearly that the peaks of Cu_2O have no much changes before and after applying 0.5 V, and no new phases appear in Cu_2O/TiO_2 nanotube electrodes after applying 0.5 V, indicating that the Cu_2O nanoparticles are stable when applying 0.5 V.

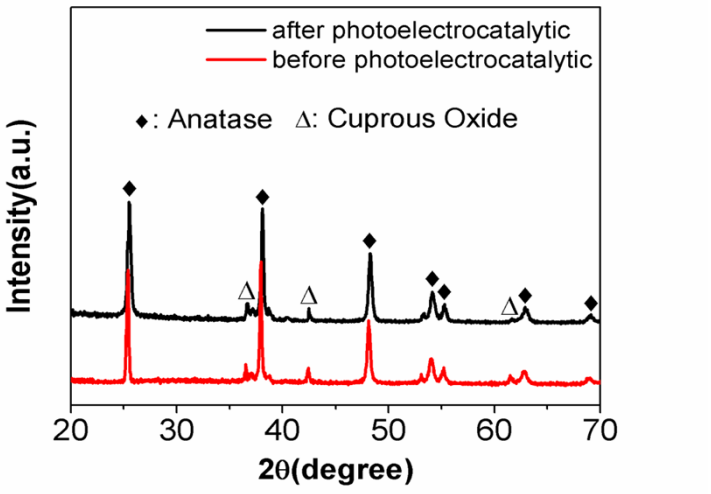

Fig. S1 XRD spectra of Cu_2O/TiO_2 nanotube arrays prepared at -1.0 V
(a) before, (b) after photoelectrocatalytic

The composition and crystallization of TiO_2 nanotube arrays annealed at 500 ºC after electrodeposition of Cu_2O nanoparticle have been checked by XRD. The XRD result based on the Cu_2O/TiO_2 nanotube arrays prepared at -1.0 V is shown in Fig. S2. From the result, we can find that the Cu_2O have been oxidated to CuO at high annealed temperature. In addition, no shift is observed on the anatase phases of Ti, which indicate that TiO_2 nanotube arrays exist only by anatase phases at 500 ºC.

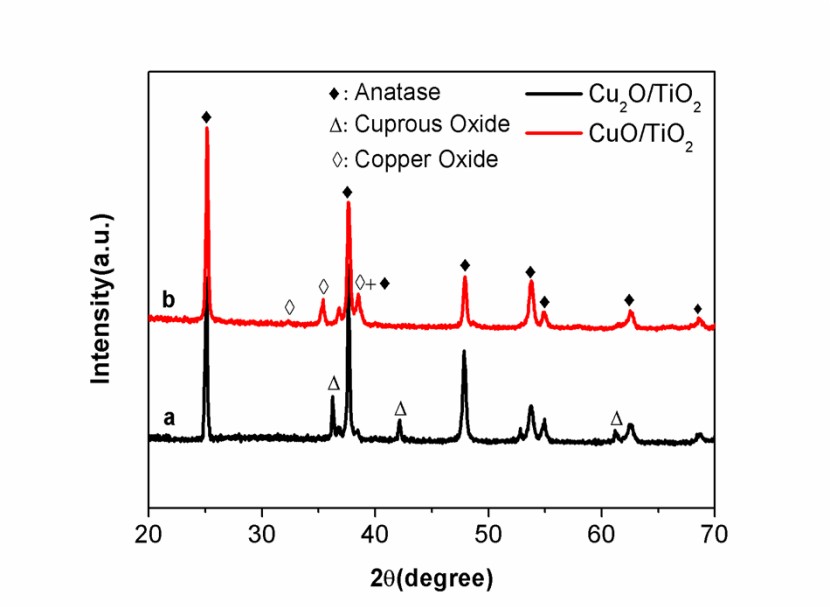

Fig. S2 XRD spectra of Cu_2O/TiO_2 nanotube arrays prepared at -1.0 V (a) before, (b) after thermal heating at 500 ºC

From the FESEM and TEM images of the cross-section of Cu_2O/TiO_2 nanotube arrays prepared at -1.2 V, the Cu_2O nanoparticles can be evenly deposited on the inner surfaces of TiO_2 nanotube arrays, as shown in Fig. S3. It is worth mention that we employ a novel and facial square wave voltammetry method to electrodeposit Cu_2O nanoparticles onto TiO_2 nanotube arrays. Due to the potential is dynamic changes during the deposition process, it determine the Cu_2O nanoparticles can be uniformly dispersed on the inner surfaces and interfaces of TiO_2 nanotube arrays and don't form some agglomerates inside the TiO_2 nanotube arrays.

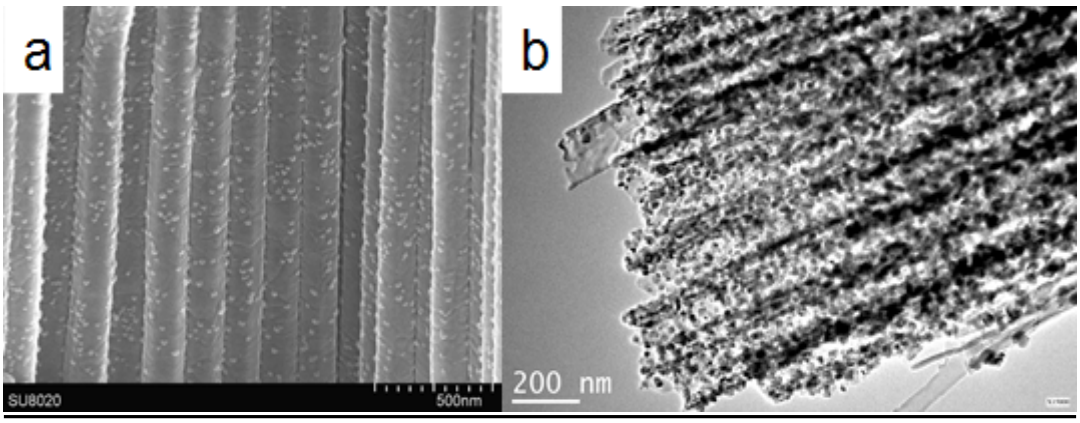

Fig. S3 (a) FESEM image of the cross-section of Cu_2O/TiO_2 nanotube arrays prepared at -1.2 V; (b) TEM image of Cu_2O/TiO_2 nanotubes prepared at -1.2 V.