Supporting information (SI)

3D Nanostructured $WO_3/BiVO_4$ Heterojunction Derived from *Papilio paris* for Efficient Water Splitting †

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As shown in Figure S1, the wings of *Papilioparis*are about 6~8 cm, the forewings appear black and have aeneous scales on their surfaces. The high resolution image in Figure 1b reveals that the black wing scales have structures including inverse V-type ridges and three hole arrays. The ridges are decorated with nano-scale ribs of about 400 nm wide and the space between each ridge is filled with net-like structure which is called quasi-honeycomb structure. The quasi-honeycomb structure can absorb visible light to an utmost degree over 95 % absorption rate. Sunlight can be highly absorbed by the black wing in two ways (Figure 1c). When light reaches the ribs, it will be scattered and reflected in the holes with attenuated intensity and be absorbed by the quasi-honeycomb structure. The incident light of which directly pass through the hole layer, will be absorbed by the bottom substrate finally. The optimal prototypes from the black scales can be extracted for absorption, which could assist the design of photocatalysts.

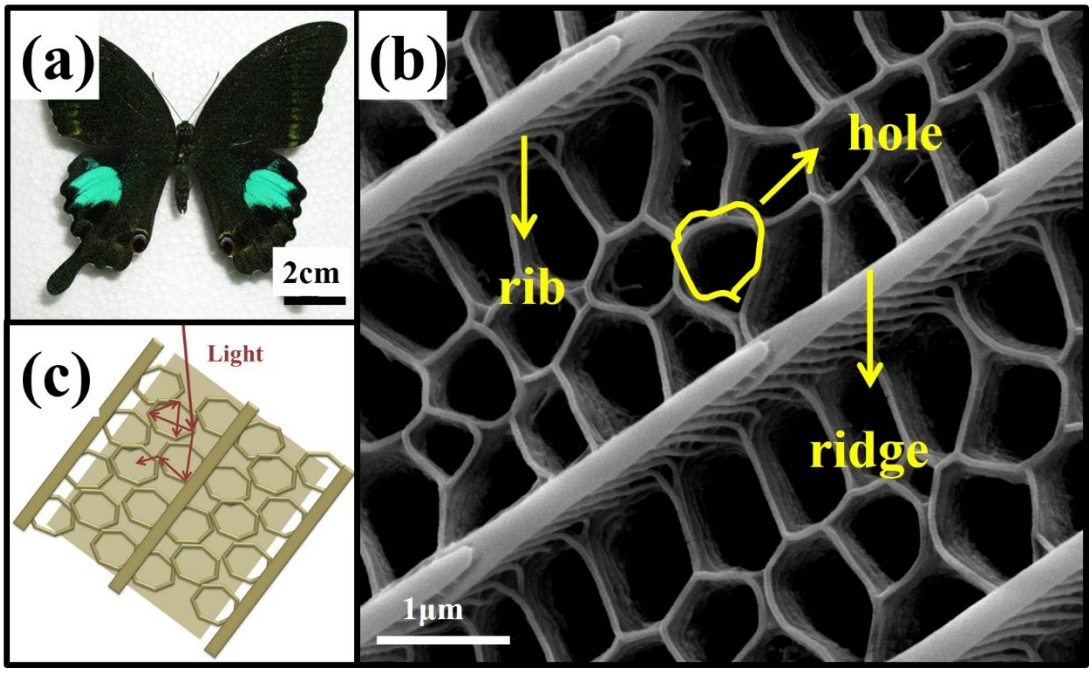

Figure S1 (a) An overall view of the Characterization of *Papilioparis* butterfly wing. (b) FESEM image showing the architecture from the top view. (c) 2D model from the FESEM images, showing the ways to absorb solar by *Papilioparis* butterfly wing.

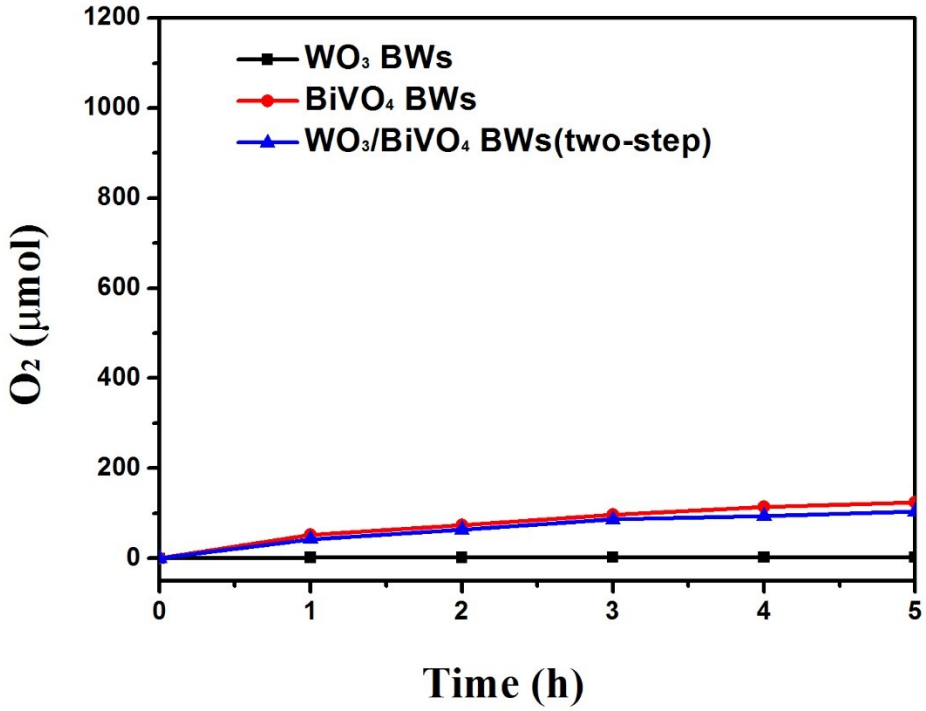

Figure S2 Photocatalytic O_2 evolution of WO_3BWs, $BiVO_4$BWs, and WO_3/$BiVO_4$BWs(two-step) under visible light irradiation ($\lambda > 420$ nm). The amount is kept the same for all the samples.