**Supporting information**

**Fig. S1** FE-SEM images of as-prepared precursor ZnSn(OH)$_6$ samples synthesized with different NaOH moles: (a, b) 60 mmol, (c, d) 66 mmol, (e, f) 72 mmol, (g, h) 78 mmol.

**Fig. S2** SEM images of cross-section image of photoanodes of Zn$_2$SnO$_4$/SnO$_2$. 
Fig. S3 Impedance spectra of DSSCs based on ZS, AZS0, AZS1, AZS2, AZS3 and AZS4 photoanodes measured under forward bias in dark.