Supporting Information

One-step and large-scale synthesis of anatase TiO₂ mesocrystals along [001] orientation with enhanced photocatalytic performance

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**Fig. S1** XRD patterns of the as-prepared TiO$_2$ samples with different TEOS and NaAc•3H$_2$O amount: (a) 0.1 mL TEOS and 1.1022 g NaAc•3H$_2$O; (b) 0.4 mL TEOS and 1.1022 g NaAc•3H$_2$O; (c) 0.2 mL TEOS and 0.5511 g NaAc•3H$_2$O; (d) 0.2 mL TEOS and 2.2044 g NaAc•3H$_2$O.

**Fig. S2** TEM images of the as-prepared TiO$_2$ samples with different TEOS amount: (a-c) 0.1 mL TEOS and 1.1022 g NaAc•3H$_2$O; (d-f) 0.4 mL TEOS and 1.1022 g NaAc•3H$_2$O; (b) inset: TEM image of rhombic-shaped TiO$_2$ nanocrystals.
Fig. S3 TEM images of the as-prepared TiO$_2$ samples with different NaAc$\cdot$3H$_2$O amount: (a-c) 0.2 mL TEOS and 0.5511 g NaAc$\cdot$3H$_2$O; (d-f) 0.2 mL TEOS and 2.2044 g NaAc$\cdot$3H$_2$O.

Fig. S4 XRD patterns of anatase TiO$_2$ mesocrystals annealed in air at different temperature for 2h: (a) without annealing; (b) 300$^\circ$C; (c) 400$^\circ$C; (d) 500$^\circ$C; (e) 600$^\circ$C; (f) 700$^\circ$C; (g) 800$^\circ$C; (h) 900$^\circ$C; (i) 1000$^\circ$C
Fig. S5 A: photocatalytic degradation of MB on anatase TiO$_2$ mesocrystals annealed in air at different temperature for 2h; B: the kinetic plots of MB photodegradation; C$_0$ and C are the initial MB concentration and concentration at irradiation time t (min), respectively. (a) anatase TiO$_2$ mesocrystals; (b) 300°C; (c) 400°C; (d) 500°C; (e) 600°C; (f) 700°C; (g) 800°C; (h) 900°C; (i) 1000°C