Electronic Supplementary Information

Metal–organic framework micro-nano reactors as armour of *Escherichia coli* for the hydrogen production in air

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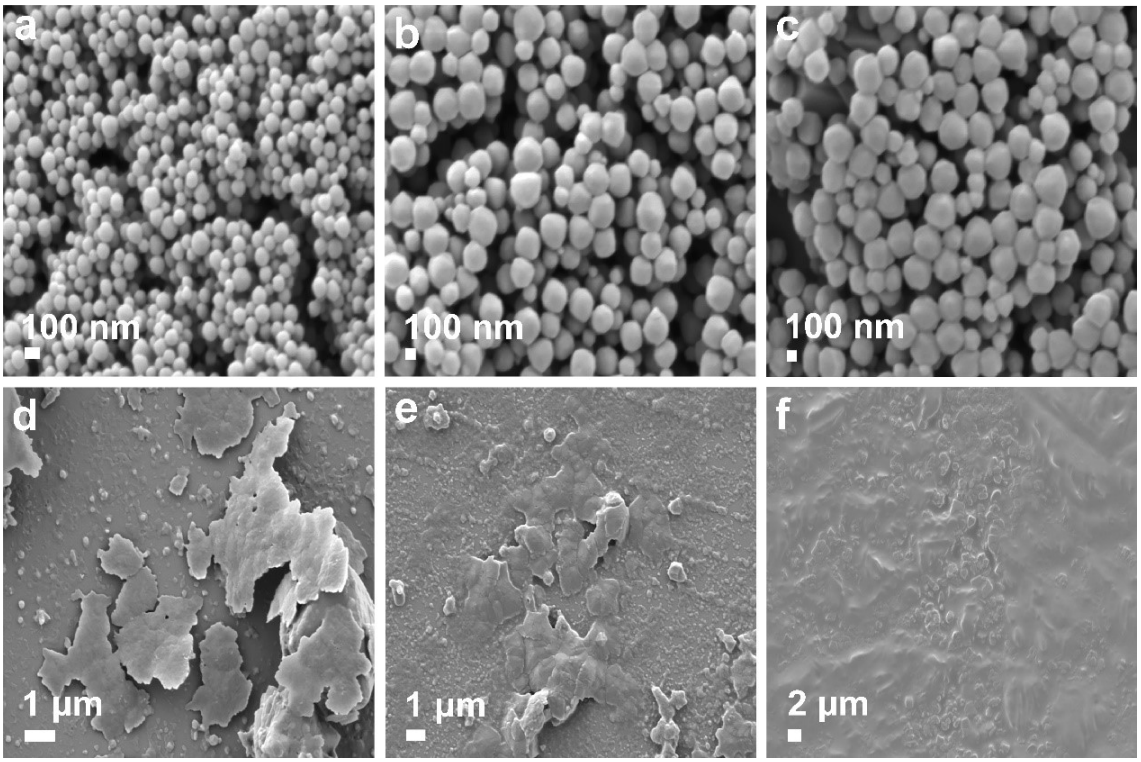

Figure S1 SEM images of ZIF-8 synthesized by reacting with Zn ions and 2-MeIm at a mass ratio of 1:30 for (a) 10 min, (b) 20 min, and (c) 30 min. SEM images of ZIF-8 synthesized by reacting with Zn ions and 2-MeIm at a mass ratio of 1:2 for (d) 40 min, (e) 60 min, and (f) 90 min.

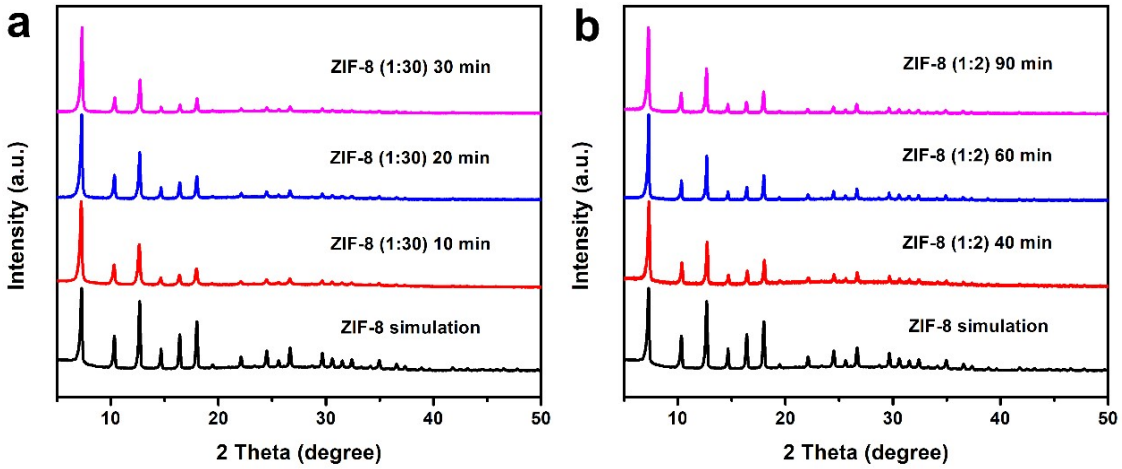

Figure S2 (a) XRD patterns of ZIF-8 synthesized by reacting with Zn ions and 2-MeIm at a mass ratio of 1:30 for 10 min, 20 min, and 30 min, respectively. (b) XRD patterns of ZIF-8 synthesized by reacting with Zn ions and 2-MeIm at a mass ratio of 1:2 for 40 min, 60 min, and 90 min, respectively.

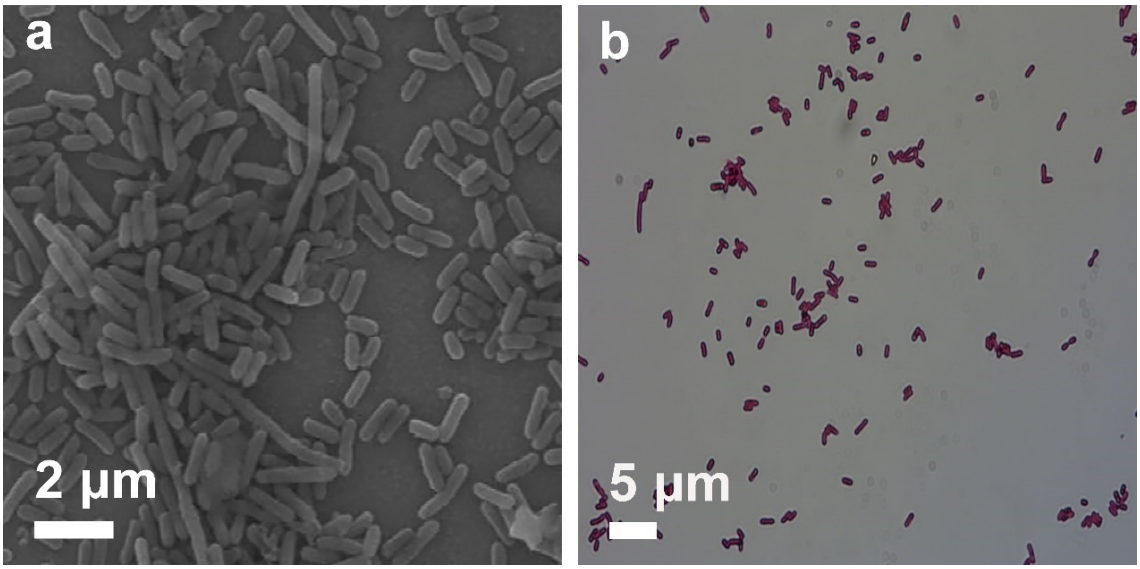

Figure S3 (a) SEM image of *E. coli*. (b) Optical microscope image of *E. coli*.

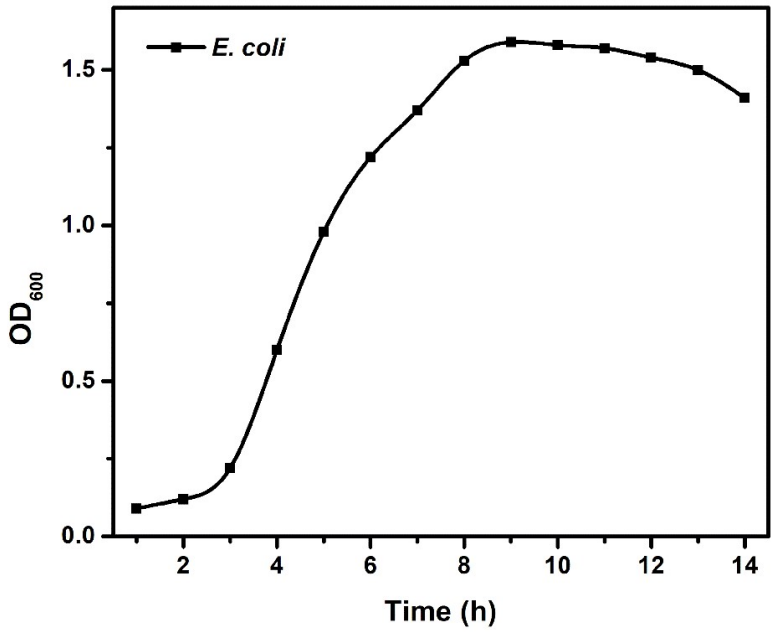

Figure S4 Growth curve of *E. coli*.

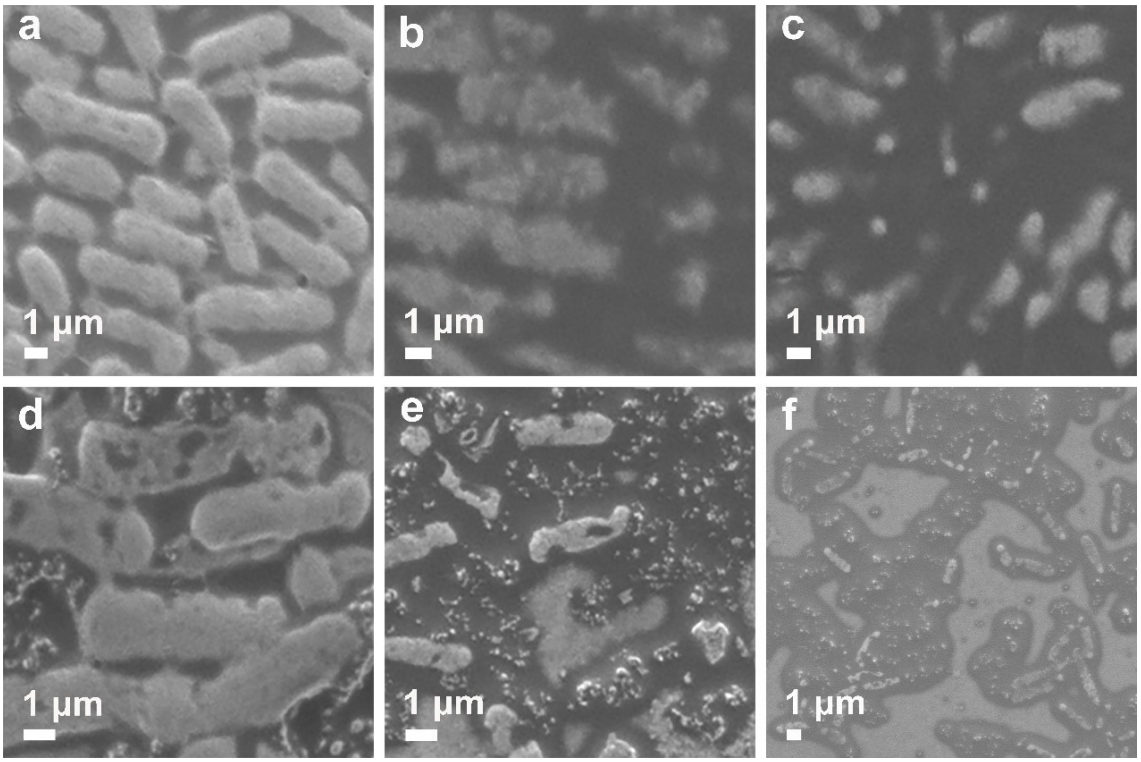

Figure S5 SEM images of *E. coli* under different conditions. (a) 0.5 M, (b) 1 M, (c) 2 M zinc ion solution was added to *E. coli* respectively. (d) 3.5 M, (e) 7 M, (f) 10 M 2-MeIm solution was added to *E. coli* respectively.

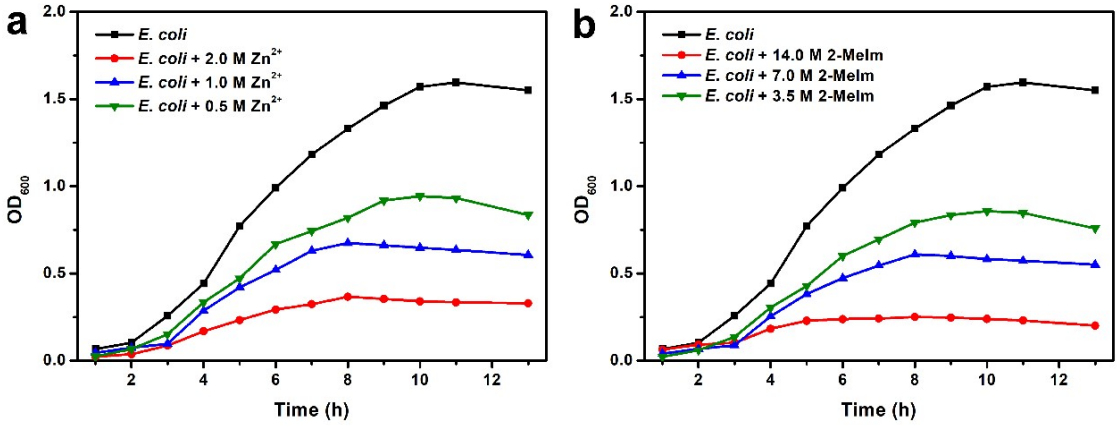

Figure S6 Growth curves of *E. coli* under different conditions. (a) *E. coli* in different concentrations of zinc ion solutions. (b) *E. coli* in different concentrations of 2-MeIm solutions.

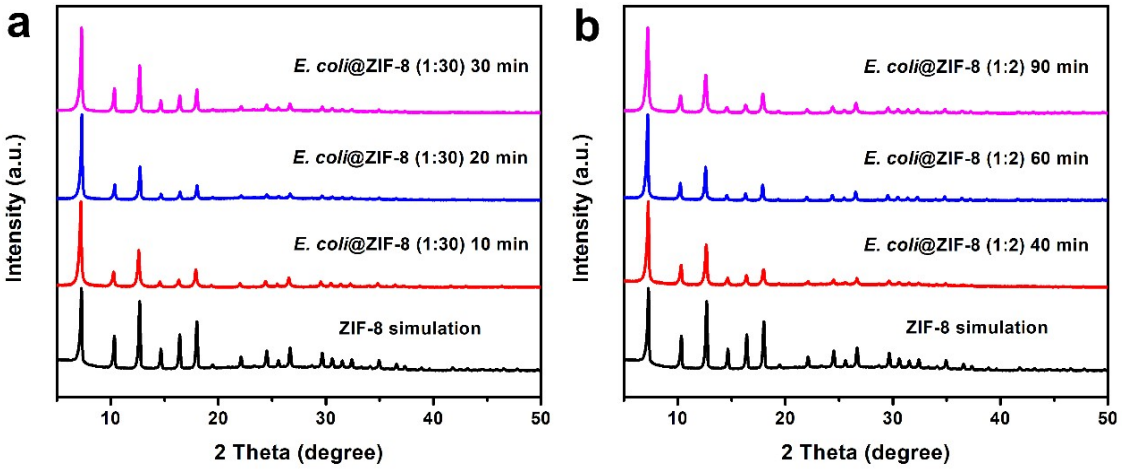

Figure S7 (a) XRD patterns of *E. coli*@ZIF-8 (1:30) for reacting 10 min, 20 min, and 30 min, respectively. (b) XRD patterns of *E. coli*@ZIF-8 (1:2) for reacting 40 min, 60 min, and 90 min, respectively.

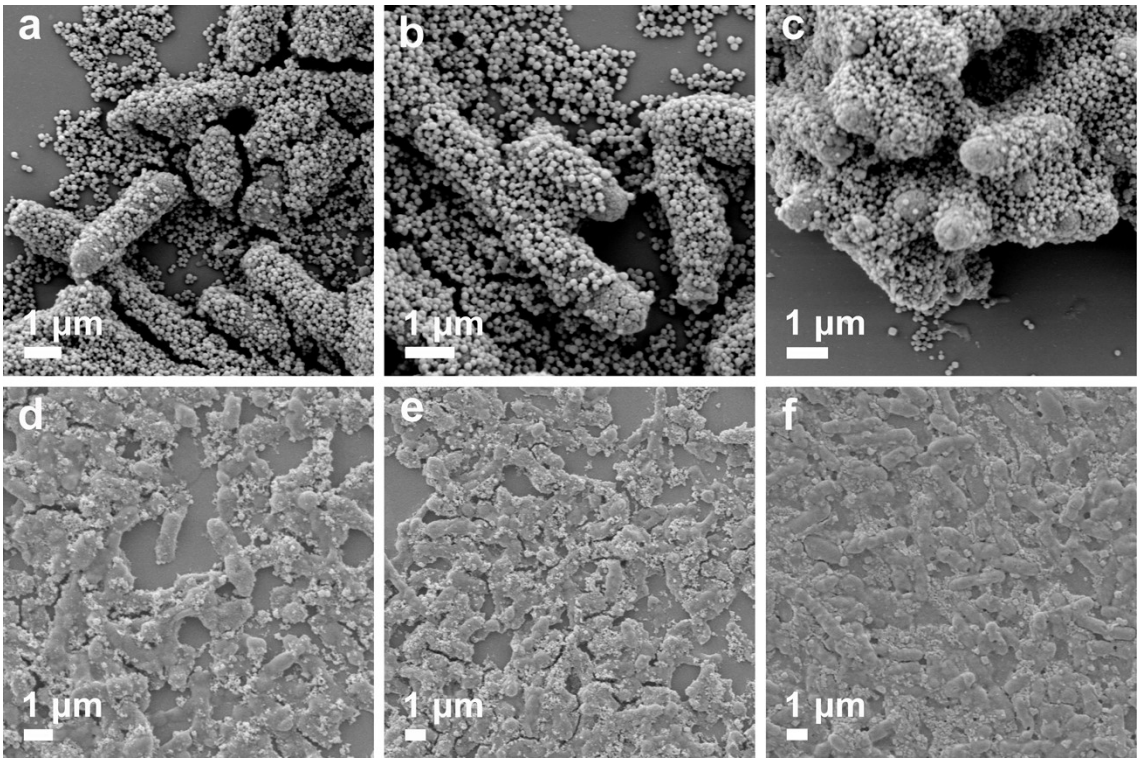

Figure S8 (a-c) SEM images of *E. coli*@ZIF-8 MNR with precursors mass ratio of 1:30 and reaction times of 10, 20, and 30 min after hydrogen production. (d-f) SEM images of *E. coli*@ZIF-8 MNR with precursors mass ratio of 1:2 and reaction times of 40, 60, and 90 min after hydrogen production.

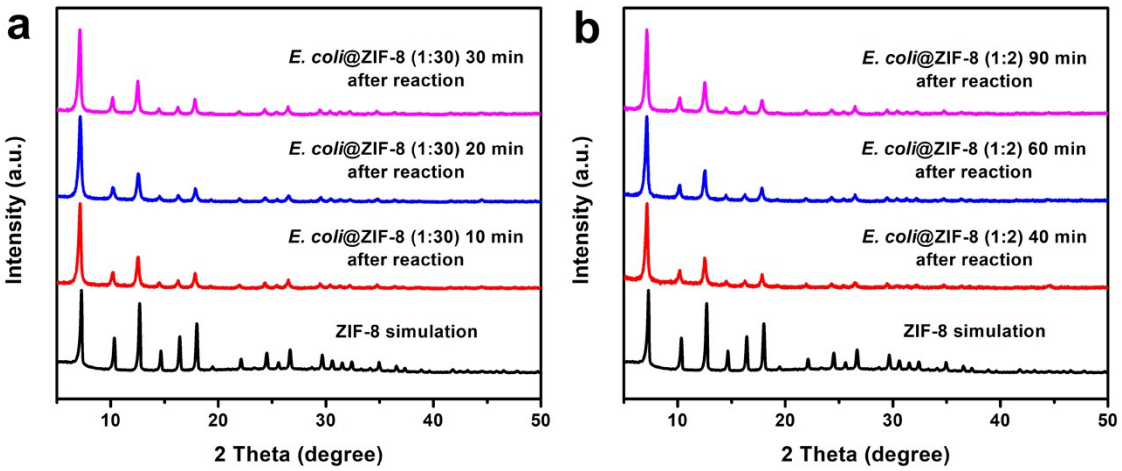

Figure S9 (a) XRD patterns of *E. coli*@ZIF-8 MNR with precursors mass ratio of 1:30 and reaction times of 10, 20, and 30 min after hydrogen production. (b) XRD patterns of *E. coli*@ZIF-8 MNR with precursors mass ratio of 1:2 and reaction times of 40, 60, and 90 min after hydrogen production.