Electronic Supplementary Information

Bio-inspired Self-Propelled Diatom Micromotor by Catalytic Decomposition of H_2O_2 Under Low Fuel Concentration

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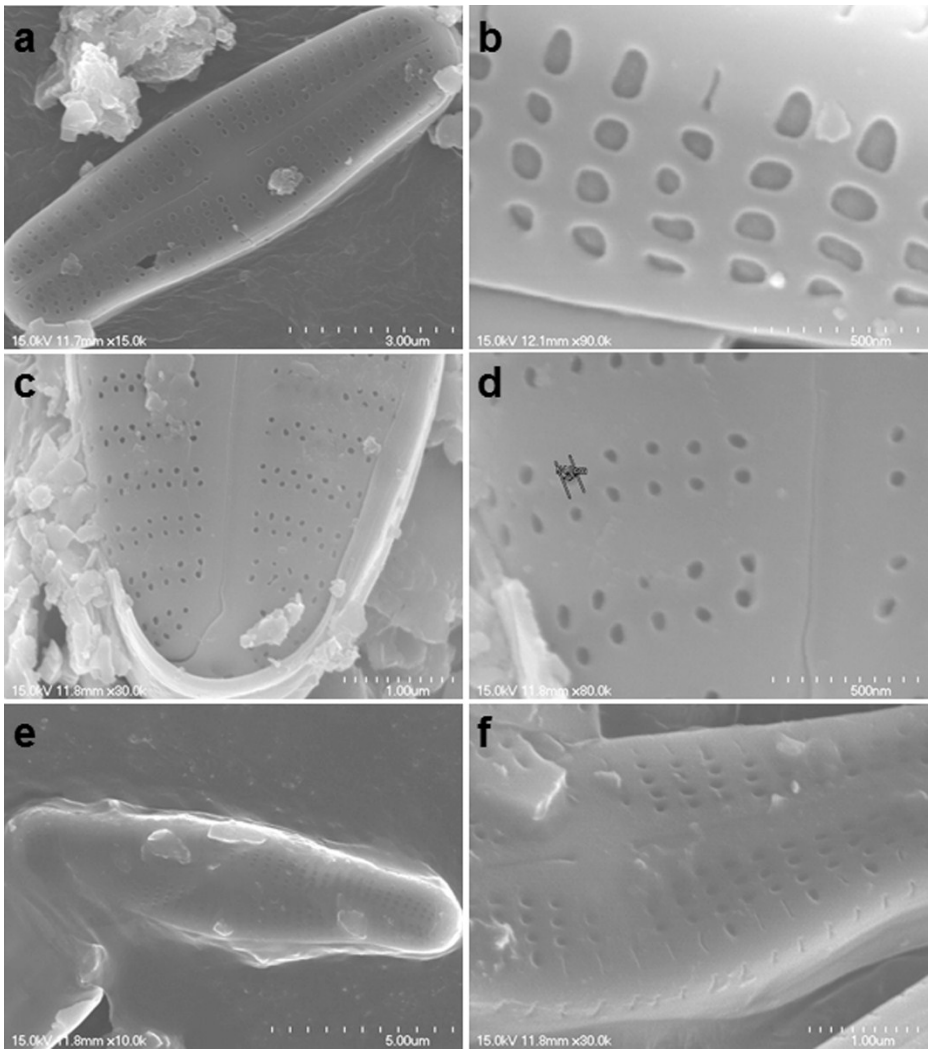
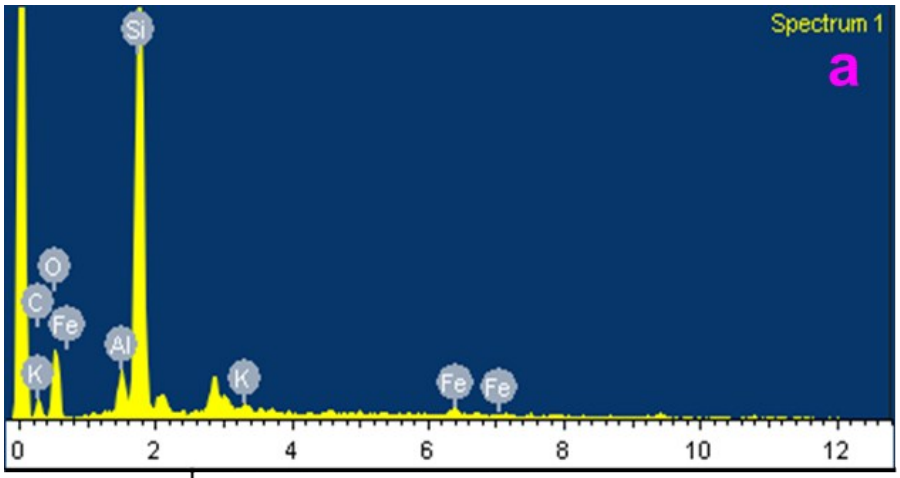


Fig. S1. SEM images of (a, b) pure diatom; (c, d) H_2O_2@diatom; and (e, f) EDTA- H_2O_2@diatom.



Element	Weight%	Atomic%
C K	24.52	37.94
O K	27.38	31.81
Al K	3.05	2.10
Si K	39.43	26.09
K K	1.29	0.61
Fe K	4.34	1.45
Totals	100.00	

b

Fig. S2. (a) EDX of diatom and (b) elemental composition of diatom.

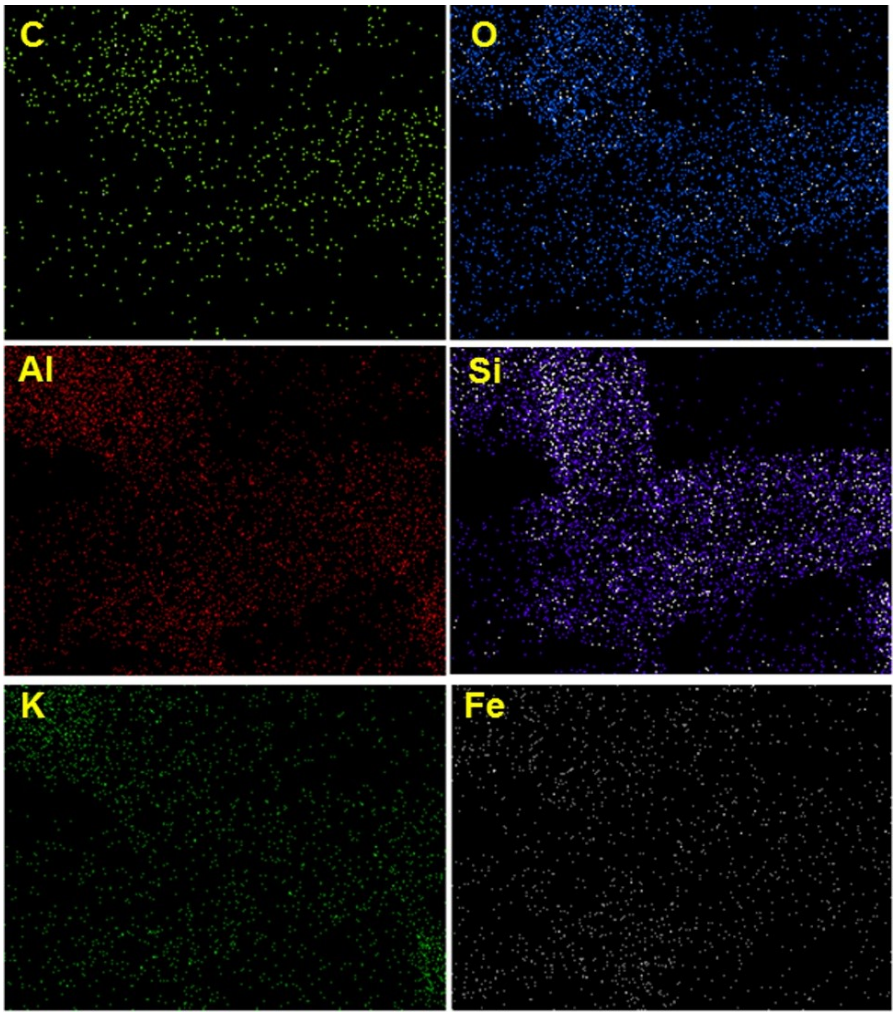


Fig. S3. Elemental mapping of diatom.

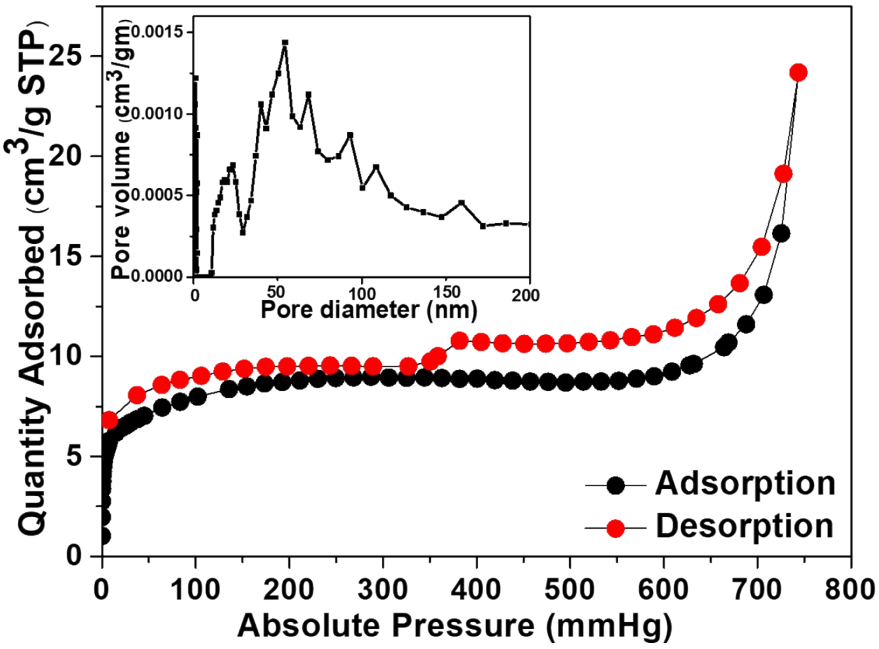


Fig. S4. BET surface area and pore-size distribution analysis of diatom.

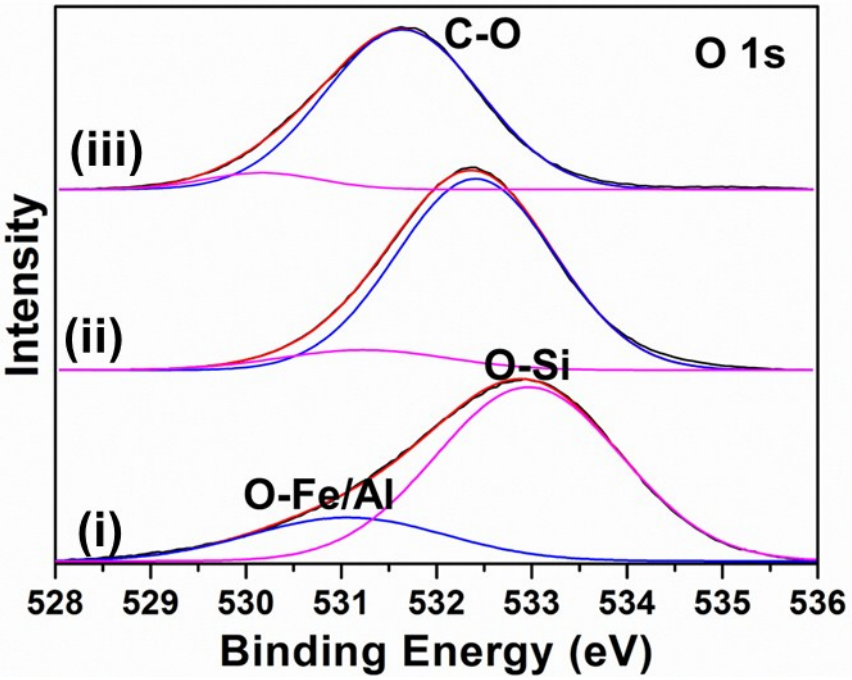


Fig. S5. High-resolution XPS spectrum of O 1s (i) pure diatom, (ii) H_2O_2@diatom and (iii) EDTA-H_2O_2@diatom.

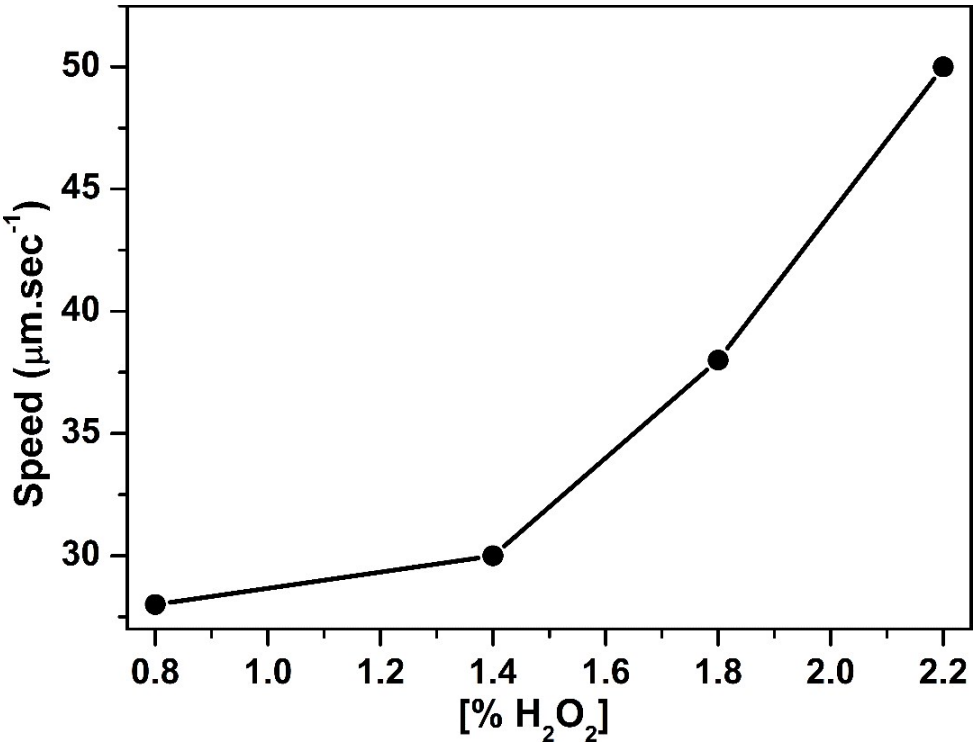


Fig. S6. Micro-motor speed with respect to fuel concentration (H_2O_2).

DPPH free radical scavenging assay

Free radical-induced diatoms self-propulsion activity in the presence of 0.8 w/v% H_2O_2 was examined using 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. Based on the standard protocol, bare DPPH, DPPH in the presence of diatoms, and DPPH in the presence of diatoms with H_2O_2 have been recorded using UV-vis spectrophotometer. In a typical run, 500 µL of 50 µM DPPH was mixed with approximately 1 mg of diatoms in the presence or absence of 50 µL of 0.8 w/v% H_2O_2 in a vial. These vials were wrapped with the aluminum foil and incubated for 30 min at room temperature. The free radical generation has been measured using a UV-vis spectrophotometer after incubation (Fig. S7). All readings were recorded at ambient temperatures.

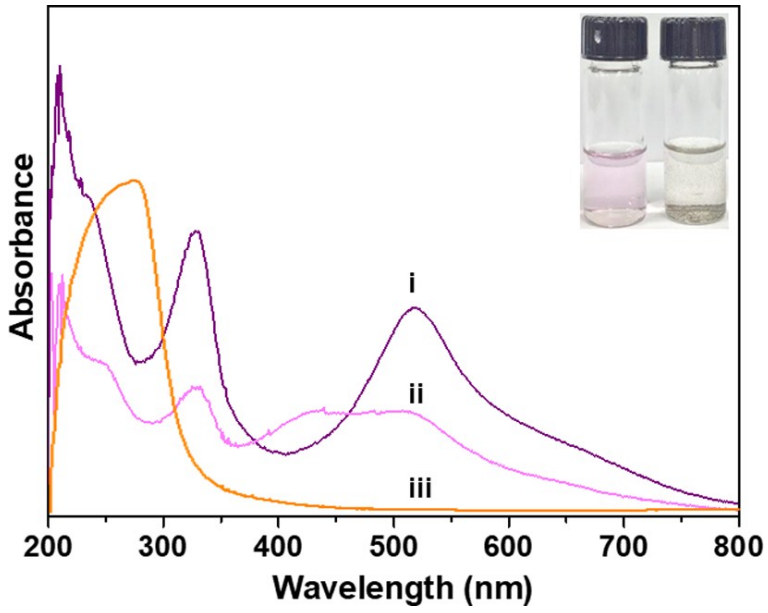


Fig. S7 Free radical scavenging activity of (i) DPPH, (ii) DPPH with diatoms, (iii) DPPH with diatoms in the presence of H_2O_2 and (inset photo) neat DPPH on left and DPPH with diatoms in the presence of H_2O_2 (right).

Table. S1 Normality of $KMnO_4$= 0.001N, titrated against Sodium oxalate to get the normality of $KMnO_4$

Time (min)	Volume of $KMnO_4$ used (Blank H_2O_2 in mL)	Volume of $KMnO_4$ used (Diatom and H_2O_2 in mL)	Volume of remaining $KMnO_4$	% of Consumption of H_2O_2	% of Consumption of H_2O_2 after addition of EDTA
0	37	37	13	0	0
1	37	33	17	11	1.5
3	37	24	26	35	4.5
5	36.5	19	31	49	7.2
10	36	15	35	60	8
15	36	15	35	60	8