

Electronic Supplementary Material (ESI) for Analytical Methods.
This journal is © The Royal Society of Chemistry 2019

Supporting Information

Fe^{II}Fe^{III} layered double hydroxide nanosheets (Fe^{II}Fe^{III} LDHNS) as an enzyme mimic for colorimetric detection of H₂O₂

Department of Chemistry, Faculty of Science, Ubon Ratchathani University,

Ubon Ratchathani 34190, Thailand.

Corresponding author: Tel.; +66 45-353407 ext. 4634, fax; +66 45-288 379

*E-mail: suparb.t@ubu.ac.th

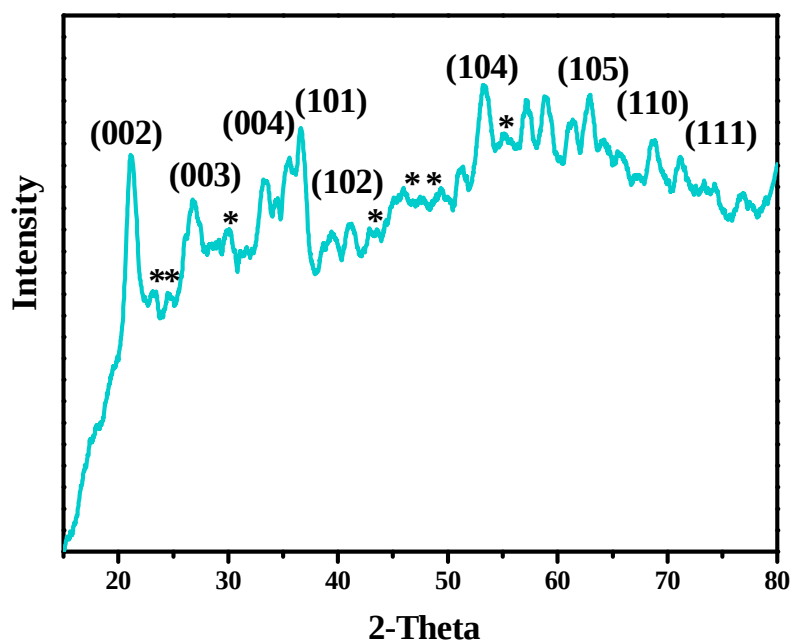


Fig. S1 XRD pattern of Fe^{II}Fe^{III} LDHNS.

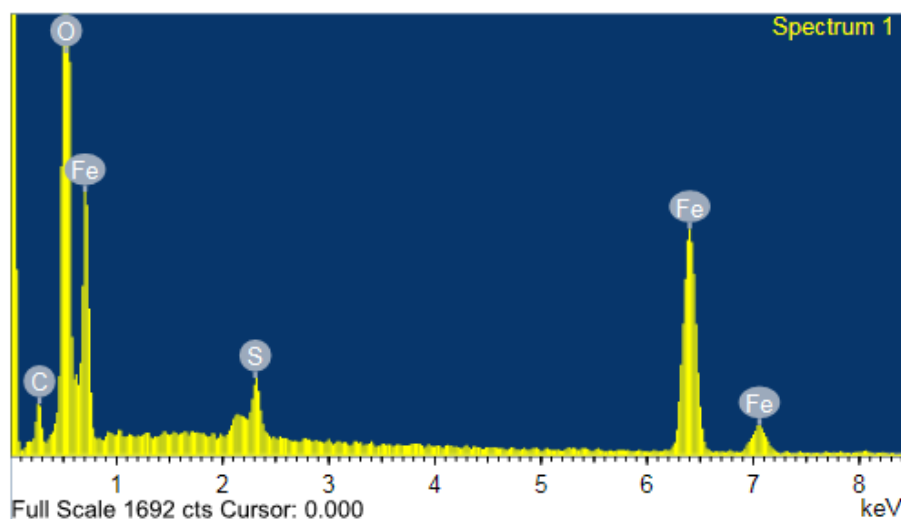


Fig. S2 EDS spectra of $\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}$ LDHNS.

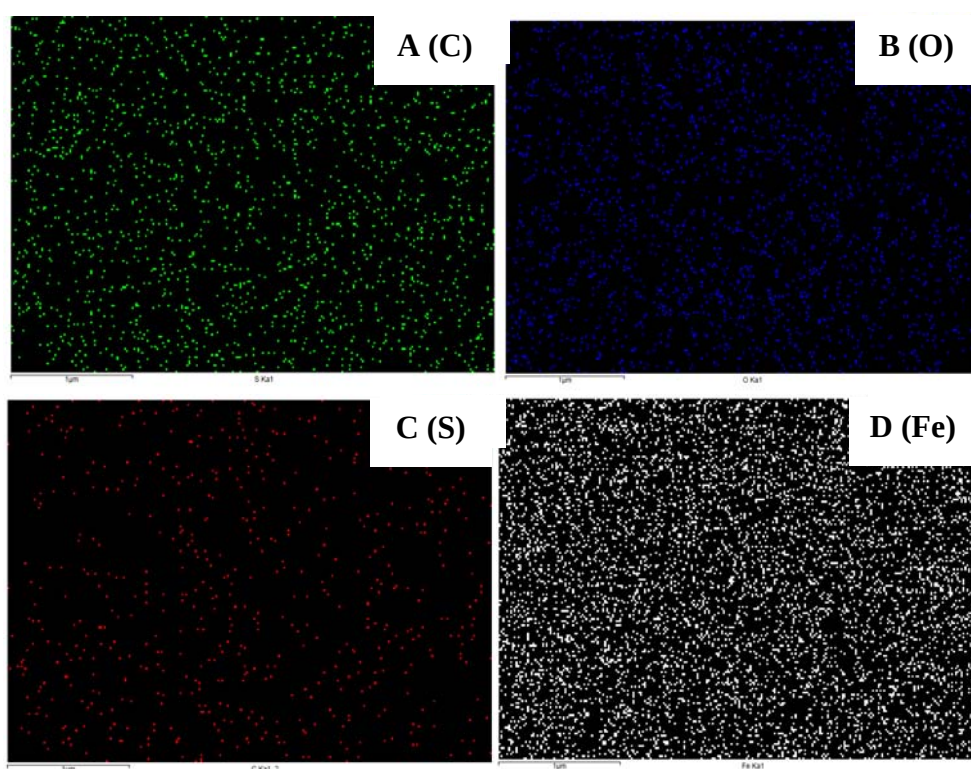


Fig. S3 SEM-EDS elemental mapping images of $\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}$ LDHNS.

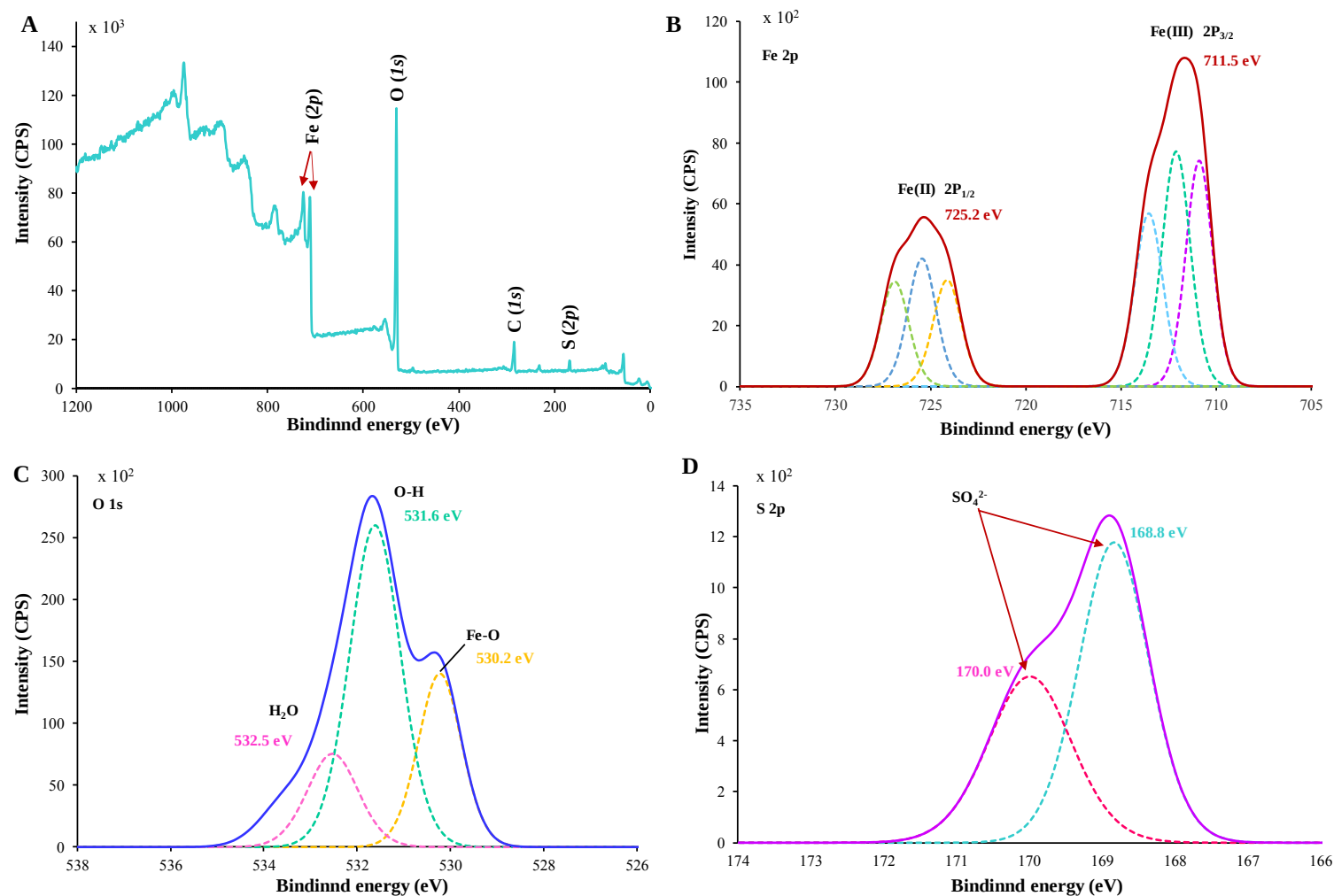
23 **Table S1** The elemental quantity of the element normalized.

Sample	Element	Weight %	Atomic %
Fe ^{II} Fe ^{III} LDHNS	C	6.22	12.03
[Fe ₄ ²⁺ Fe ₂ ³⁺ (OH ⁻) ₁₂] ²⁺ •	O	46.72	67.89
[SO ₄ ²⁻ •2H ₂ O] ²⁻	S	1.58	1.15
	Fe	45.47	18.93
	Total	100	100

24

25

26



27

28 **Fig. S4** (A) X-ray Photoelectron Spectroscopy (XPS) survey spectra of Fe^{II}/Fe^{III} LDHNS. The high resolution XPS spectra of (B) Fe (2p), (C) O
29 (1s) and (D) S (2p) for Fe^{II}/Fe^{III} LDHNS

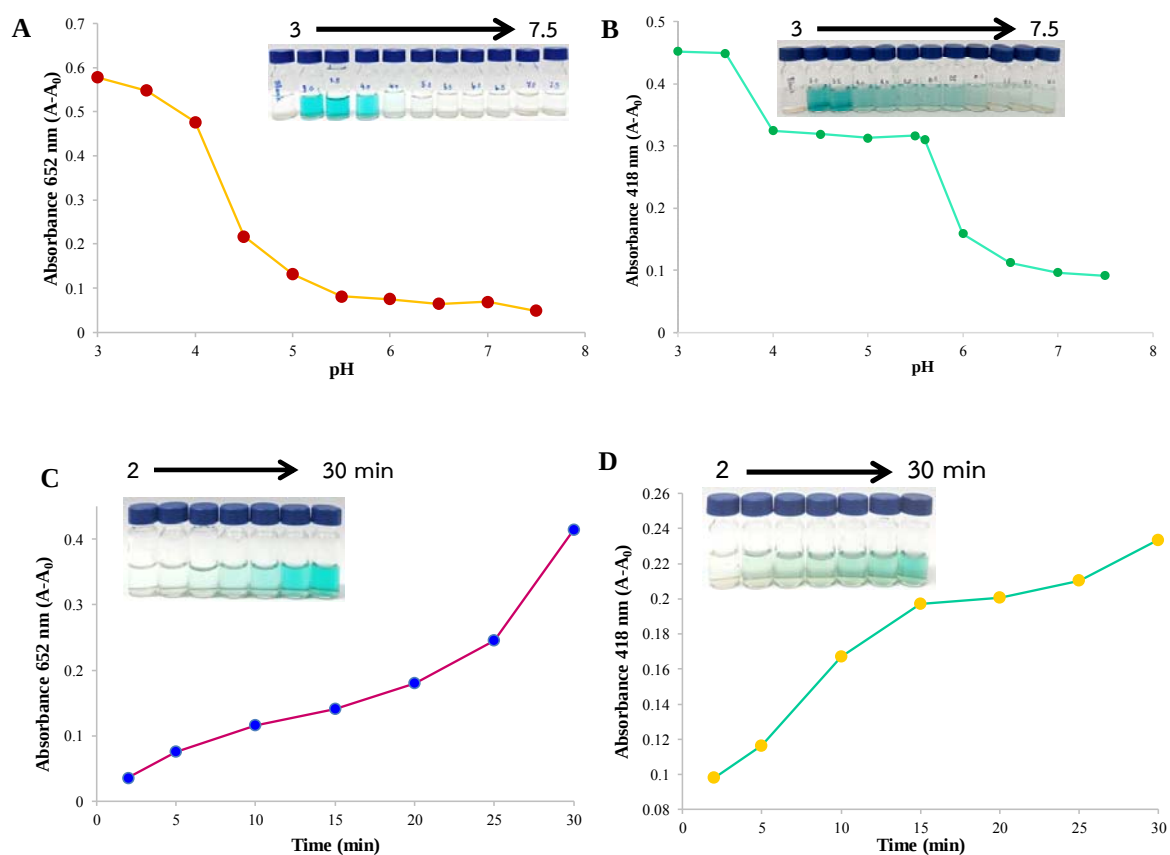


Fig. S5 (A) and (B) Effect of pH for TMB and ABTS, (C) and (D) effects of reaction time for TMB and ABTS on the catalytic activity of $\text{Fe}^{\text{II}}/\text{Fe}^{\text{III}}$ LDHNS.

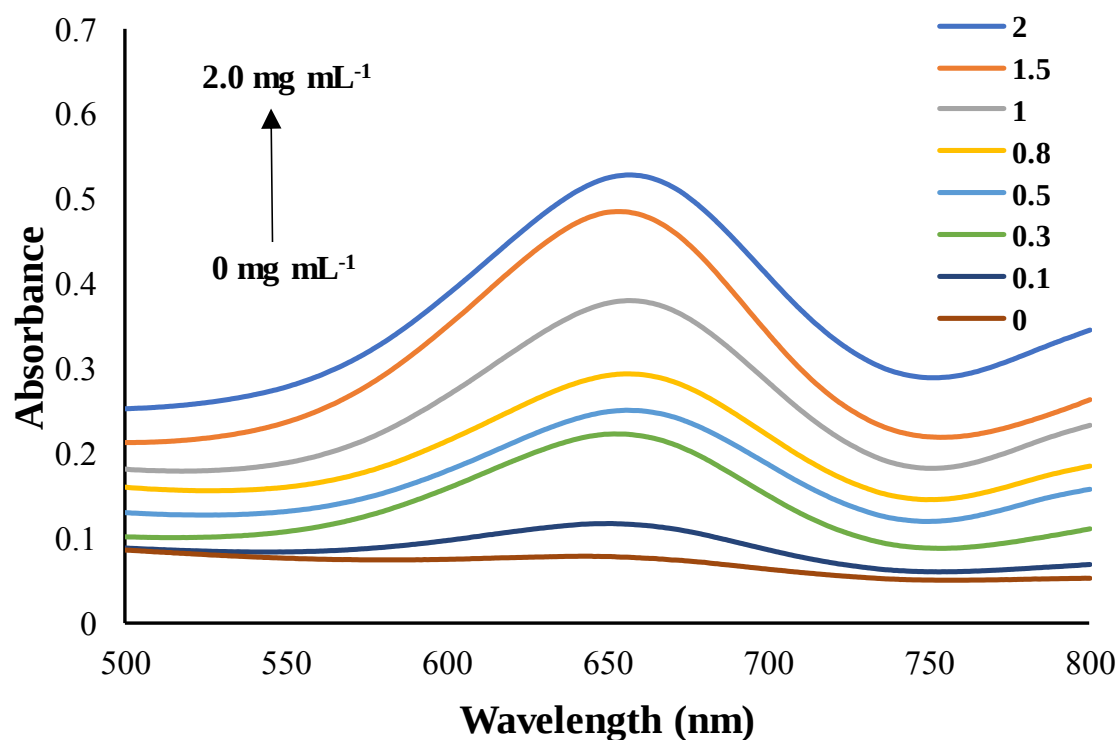
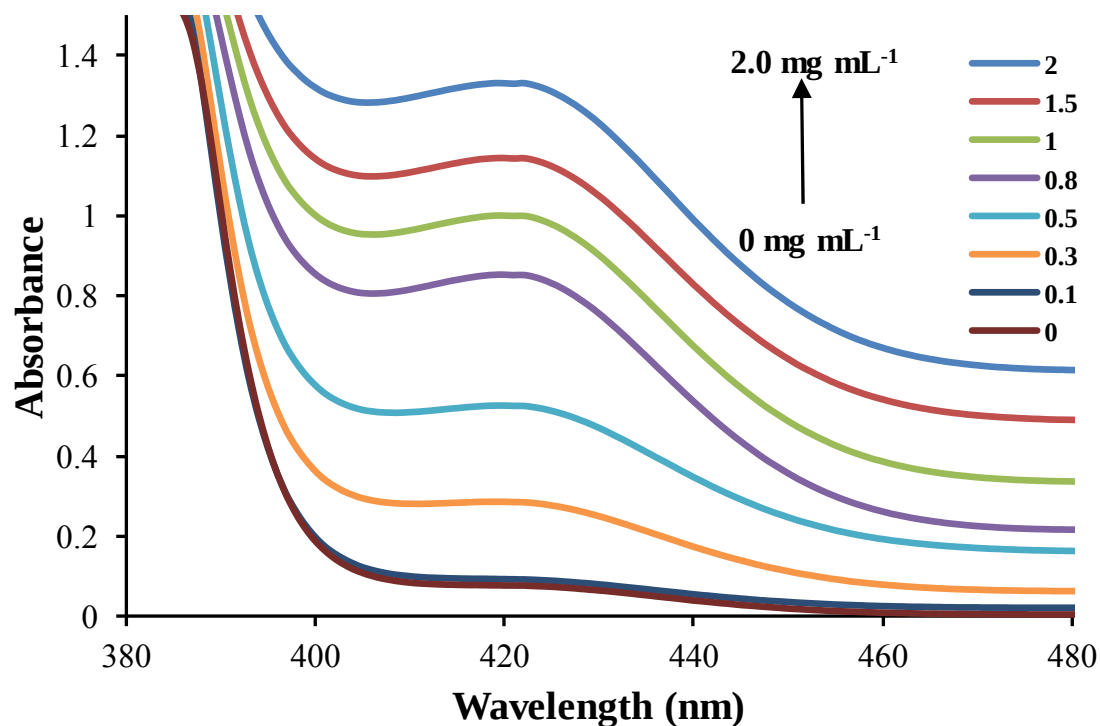


Fig. S6 Effects of $\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}$ LDHNS concentration on the catalytic oxidation of TMB. Experiments were carried out using 50 μL of difference concentration $\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}$ LDHNS, 100 μL of H_2O_2 (10 μM), 200 μL of 1 mM TMB (in ethanol) and 400 μL of 0.1 M pH 4.0 acetate buffer solution. The solution mixture was kept to react at ambient temperature (25 ± 1 $^\circ\text{C}$) for 30 min

41



42

43

44 **Fig. S7** Effects of Fe^{II}/Fe^{III} LDHNS concentration on the catalytic oxidation of ABTS.
45 Experiments were carried out using 50 μ L of difference concentration Fe^{II}/Fe^{III} LDHNS, 100
46 μ L of H₂O₂ (20 μ M), 100 μ L of ABTS (20 mM) and 500 μ L of deionized water. The solution
47 mixture was kept to react at ambient temperature (25 ± 1 °C) for 30 min.

Table S2 Comparison of maximum reaction rate ($V_{\max}$) obtained from $\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}$ LDHNS for TMB and ABTS substrate.

Catalyst ^a	$V_{\max}$ (10^{-8} M s^{-1})		Reference	Catalyst ^a	$V_{\max}$ (10^{-8} M s^{-1})		Reference
	TMB	H_2O_2			ABTS	H_2O_2	
HRP ^a	10.0	8.71	20	HRP	-	-	62
Fe_3O_4 NPs	3.44	9.78	20	$\text{Fe}_3\text{O}_4\text{-NH}_2\text{-SH}$	60.0	51.0	63
NiFe-LDHNS	-	-	32	NiCo-LDHs	3.29	3.24	21
Co-Al ELDH	-	-	42	$\text{Fe}_3\text{O}_4\text{@Au-Cys-FA NPs}$	10.95	2.03	23
DNA/CuAl-LDHs	4.09	2.30	43	NiFe_2O_4	17.48	14.11	30
C-dot/NiAl-LDHs	5.52	7.89	44	Prussian blue NPs	-	-	39
$\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}$ LDHNS	1.70	9.37	This work	$\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}$ LDHNS	3.46	7.19	This work

^aCatalyst: HRP (horseradish peroxidase), NPs (nanoparticles), ELDHs (exfoliated layered double hydroxides), LDHs (layered double hydroxides), LDHNS (layered double hydroxide nanosheets).

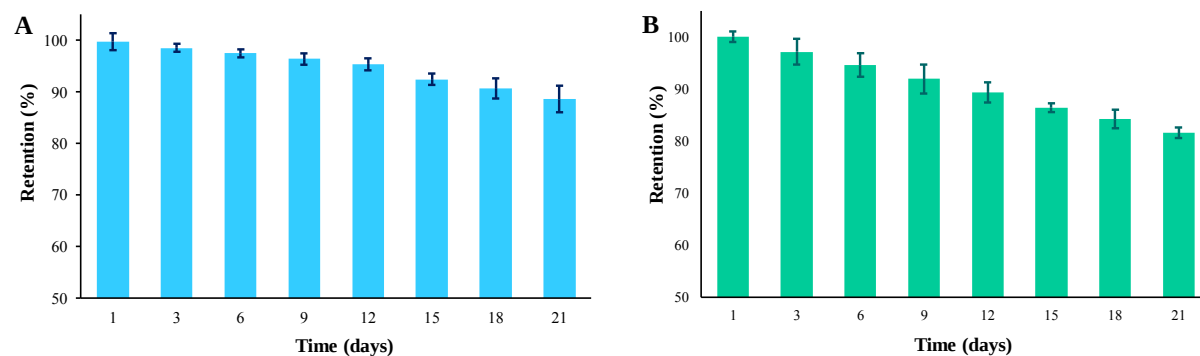


Fig. S8 The long-term stability of $\text{Fe}^{\text{II}}\text{Fe}^{\text{III}}$ LDHNS for colorimetric detection of H_2O_2 by using TMB (A) and ABTS (B) substrate for 21 days.

