

SUPPLEMENTARY INFORMATION

A green strategy for treating nitrate-contaminated wastewater using zeolite P-based composites derived from rice husk ash

Nhu Y Nguyen-Thi,^{*a} Yen Nhi Nguyen-Thi,^a Cuong-Quoc Nguyen,^b Kim-Phung Ly,^c Nguyen Minh Nhut,^d Luong Huynh Vu Thanh,^d Quang Le Dang,^{ef} Quang De Tran,^b and Phuong Lan Tran-Nguyen^e

^a*Faculty of Biological, Chemical, and Food Technology, Can Tho University of Technology, Can Tho 94000, Viet Nam.*

^b*Department of Health Sciences, College of Natural Sciences, Can Tho University, Can Tho 94000, Vietnam.*

^c*Stem Cell Laboratory, Department of Molecular Biology, Institute of Biotechnology and Food, Can Tho University, Can Tho 94000, Vietnam*

^d*Faculty of Chemical Engineering, College of Engineering, Can Tho University, Can Tho 94000, Vietnam*

^e*Institute of Materials Science, Vietnam Academy of Science and Technology (VAST), 18 Hoang Quoc Viet, Hanoi, Viet Nam*

^f*Graduate University of Science and Technology, Vietnam Academy of Science and Technology (VAST), 18 Hoang Quoc Viet, Hanoi, Viet Nam*

^g*Faculty of Mechanical Engineering, College of Engineering, Can Tho University, Can Tho 94000, Vietnam.*

* Corresponding author, email: Email: ntny@ctu.edu.vn; Tel: +84-909-163-385



Figure S1. Vietnam's seafood exports set numerous records, solidifying its position as the world's third-largest seafood exporter

(Figures from <https://seafood.vasep.com.vn/why-buy-seafood/export-potentials/vietnam-the-third-largest-seafood-exporter-in-the-world-26061.html> and <https://seafood.vasep.com.vn/why-buy-seafood/vietnam-seafood-exports-broke-many-records-in-2022-26040.html>)



Figure S2. Mass Fish Deaths and the Future of Environmental Regulation in Vietnam

(Figures from <https://www.vietnam-briefing.com/news/fish-deaths-environmental-regulation-vietnam.html/>)

Table S1. Factors affecting the synthesis of CZP composite

Sample	Weight ratio of C:ZP (w:w)	Concentration of glutaraldehyde (%)	Mixing time (h)
CZP1	1:1	2	1.0
CZP2	1:2		
CZP3	1:3		
CZP4	1:4		
CZP5	1:5		
CZP6	1:2	1	1.0
CZP7		4	
CZP8		6	
CZP9		8	

Table S2. Characteristic vibrations of ZP and CZP composites synthesized at various weight ratios of C:ZP

ZP	Wavenumber (cm⁻¹)			Types of vibration
	CZP1	CZP2	CZP3	
-	3744.6	3766.8	3744.8	O-H (chitosan)
3477.6	3449.3	3422.7	3435.0	O-H
-	2922.1	2929.4	2921.1	C-H (-CHO)
-	2331.6	2341.4	2335.8	C=N
1647.2	1653.6	1654.5	1653.7	O-H
-	1537.8	1531.5	1530.7	N-H (-NH ₂)
-	1422.4	1437.0	1438.0	C-H
-	1030.1	1010.0	1015.4	C-O-C
993.8	910.7	998.7	992.0	Si-O-Si
740.9	692.1	742.0	740.5	Si-O-Si
669.4	512.2	669.0	670.1	Al-O-Si
608.0	497.6	609.8	608.7	Al-O