Supporting information

Effects of typical engineered nanomaterials on 4-nonylphenol degradation in river sediment: basing on bacterial community and function analysis

Piao Xu [a,b,1], Ming Chen [a,b,1], Cui Lai [a,b,1], Guangming Zeng [a,b,*], Danlian Huang [a,b,*], Han Wang [a,b], Xiaomin Gong [a,b], Lei Qin [a,b], Yuanyuan Liu [c], Dan Mo [a,b], Xiaofeng Wen [a,b], Chengyun Zhou [a,b], Rongzhong Wang [a,b]

Total number of pages: 5

This Supporting Information provides 4 figures.

* Corresponding authors. Fax: +86-731-88823701; Tel: +86-73- 88823701.
E-mail: zgming@hnu.edu.cn (G.M. Zeng); huangdanlian@hnu.edu.cn (D.L. Huang).
[a] College of Environmental Science and Engineering, Hunan University, Changsha 410082, P.R. China.
[b] Key Laboratory of Environmental Biology and Pollution Control, Ministry of Education, Hunan University, Changsha 410082, P.R. China.
[c] College of Chemistry and Chemical Engineering, Changsha University of Science and Technology, Changsha 410076, P.R. China.
1 These authors contribute equally to this article.

Table S1 Characterization of the used engineered nanomaterials (ENMs)

	Purity	Size	Surface area	Average pore size
Fe_2O_3 nanoparticles	>99.5%	Spicula shape, /	94.847 m^2/g	16.718 nm
Fe_3O_4 nanoparticles	>99.5%	Cubic shape, ~50 nm	8.195 m^2/g	17.025 nm
MWCNTs	>98%	Nanotubes, diameter: 10-20 nm length: 10–30 μm	211.428 m^2/g	24.023 nm

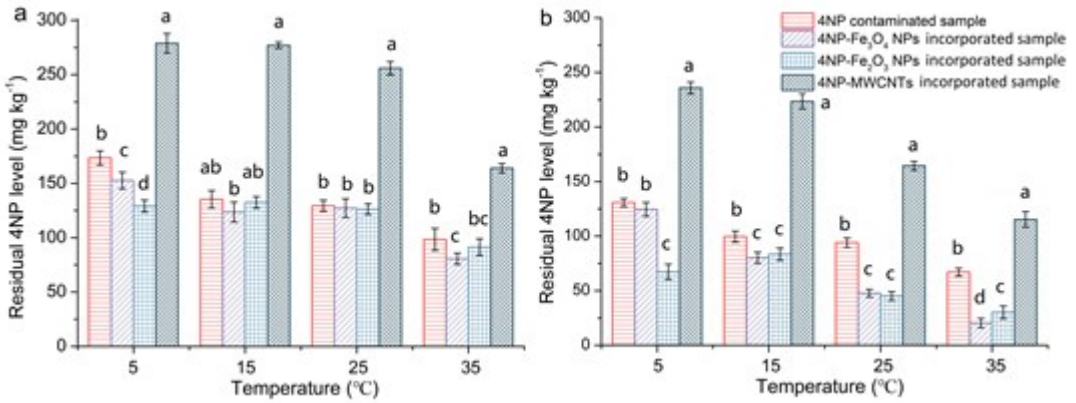

Figure S1. Temperature-dependent 4NP degradation at day 4 (a) and day 8 (b). Different letters indicate significant differences ($p < 0.05$).

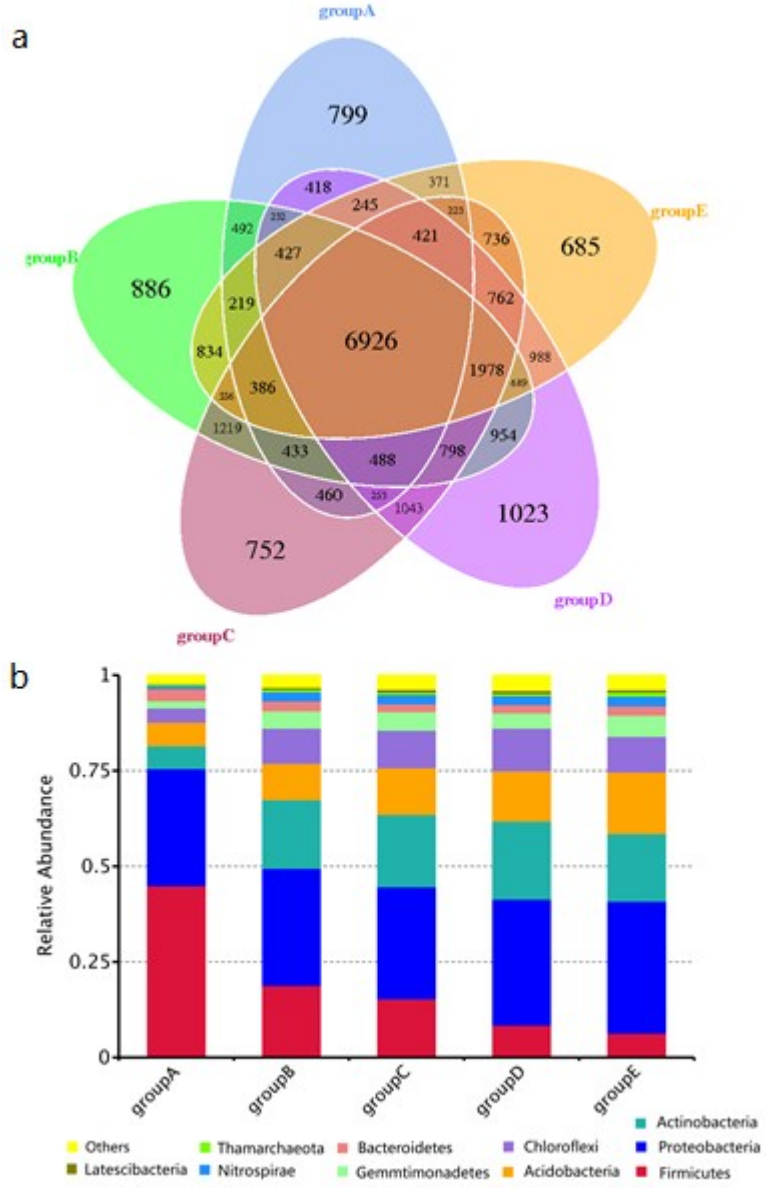

Figure S2. (a) OTUs analysis in the tested groups at day 2, 5, 15 and 30; (b) Relative abundance of bacterial community in phylum level in the tested groups. (Group A: control samples without 4NP and ENMs; group B: samples contaminated with 4NP; group C: samples incorporated with 4NP and Fe_3O_4; group D: samples incorporated with 4NP and Fe_2O_3; group E: samples incorporated with 4NP and MWCNTs).

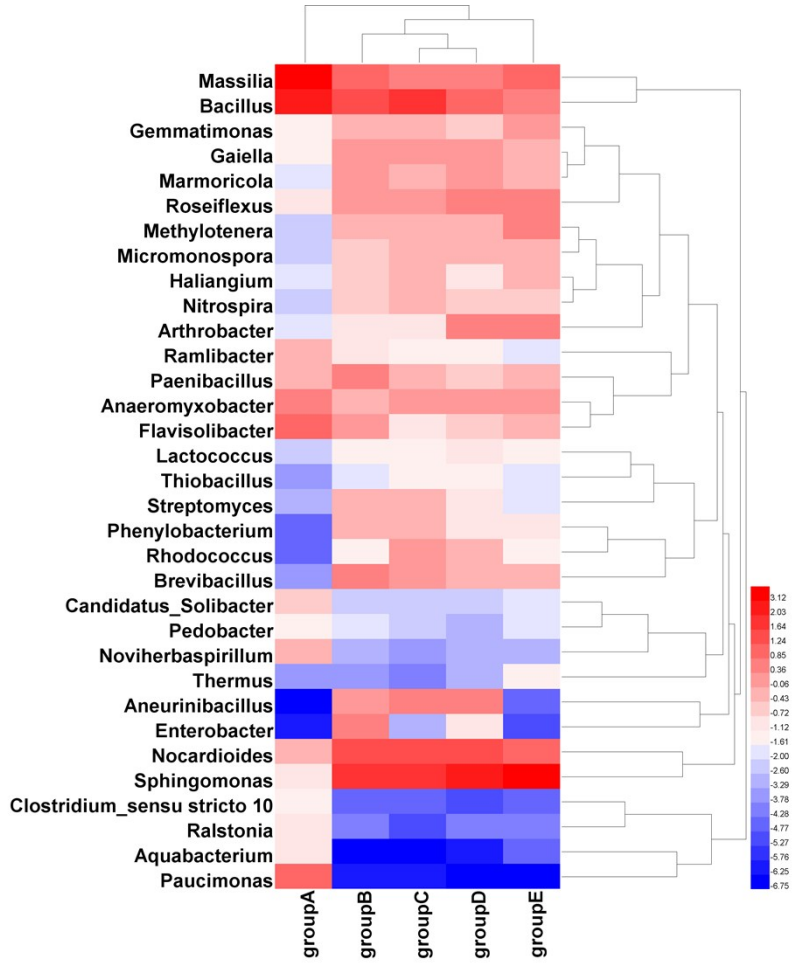

Figure S3. Heatmap in genus level analyzed in the tested five groups. (Group A: control samples without 4NP and ENMs; group B: samples contaminated with 4NP; group C: samples incorporated with 4NP and Fe_3O_4; group D: samples incorporated with 4NP and Fe_2O_3; group E: samples incorporated with 4NP and MWCNTs).

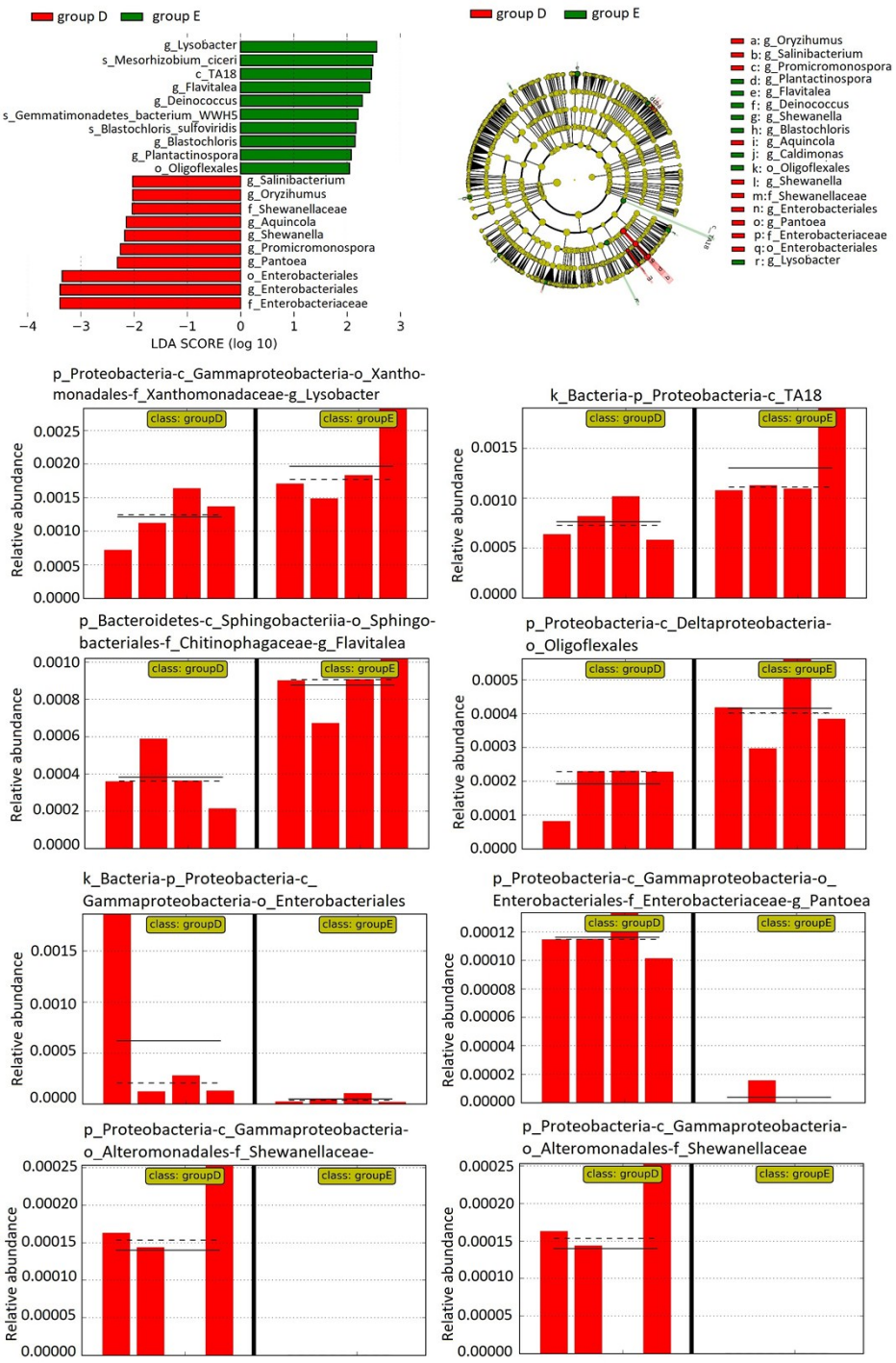

Figure S4. Biomarker detection analysis (LEfSe) on bacteria between group D and group E. (group D: samples incorporated with 4NP and Fe_2O_3; group E: samples incorporated with 4NP and MWCNTs).