

## Supporting Information for:

### Bioconcentration of TiO<sub>2</sub> nanoparticles by the freshwater nematode *Plectus aquatilis* disobeys equilibrium partitioning

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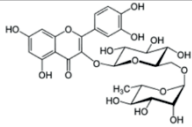
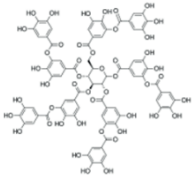
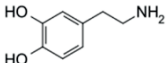
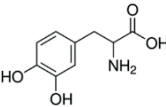
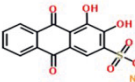
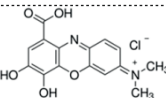

Figure SI 4) Correlation between TiO<sub>2</sub> NP internalization and A) NP agglomerate size, B) ζ-potential and C) sedimentation rate. Page 8

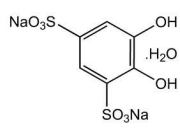
#### Text

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Table SI 1) Chemicals used for surface functionalization of TiO<sub>2</sub> NP and parameters describing particle behavior in Chriesbach water.

Chemical	Surface property	Relevance	Structure	Size in Chriesbach water (nm)	Sedimentation rate (hr <sup>-1</sup> )	ζ-potential (mV)
(+) - Rutin Trihydrate		Environmental		68.3 ± 1.1	0.00 ± 0.00	-16.2 ± 0.7
Tannic Acid				5400 ± 480	0.06 ± 0.02	-17.4 ± 0.5
Dopamine	Cation	Biological		2500 ± 350	0.21 ± 0.01	-16.0 ± 0.5
3,4-Dihydroxy-DL-phenylalanine	Zwitterion			810 ± 25	0.18 ± 0.03	-15.1 ± 0.7
Alizarin Red	Anion	Dye molecule		890 ± 20	0.02 ± 0.00	-17.5 ± 0.4
Gallocyanine	Cation			1300 ± 110	0.11 ± 0.01	-16.1 ± 0.7
Catechol	Non polar			3200 ± 640	0.09 ± 0.01	-16.1 ± 0.9

1,3-Benzenedisulfonic acid, 4,5-dihydroxy-, sodium salt	(strong) Anion			$2000 \pm 240$	$0.27 \pm 0.02$	$-16.4 \pm 0.1$
P-25	NA	Commercial	NA	$1400 \pm 110$	$0.11 \pm 0.00$	$-18.7 \pm 0.5$
Nb Doped TiO <sub>2</sub>	NA		NA	$1400 \pm 91$	$0.08 \pm 0.01$	$-17.6 \pm 0.5$

Chemicals which were used for surface functionalization of TiO<sub>2</sub> NP, with summarized classification based on the relevance and the chemical properties. Chemical structure were adapted from the producers information.

**Table SI 2) Composition of Chriesbach water.**

<b>DOC</b> <b>[mg C/l]</b>	<b>Cl<sup>-</sup></b> <b>[mM]</b>	<b>NO<sub>3</sub><sup>-</sup></b> <b>[mM]</b>	<b>SO<sub>4</sub><sup>2-</sup></b> <b>[mM]</b>	<b>K<sup>+</sup></b> <b>[mM]</b>	<b>Na<sup>+</sup></b> <b>[mM]</b>	<b>Ca<sup>2+</sup></b> <b>[mM]</b>	<b>Mg<sup>2+</sup></b> <b>[mM]</b>	<b>Ionic Strength</b> <b>[mM]</b>
3.72	0.97	0.36	0.25	0.11	0.84	2.59	0.62	8.05

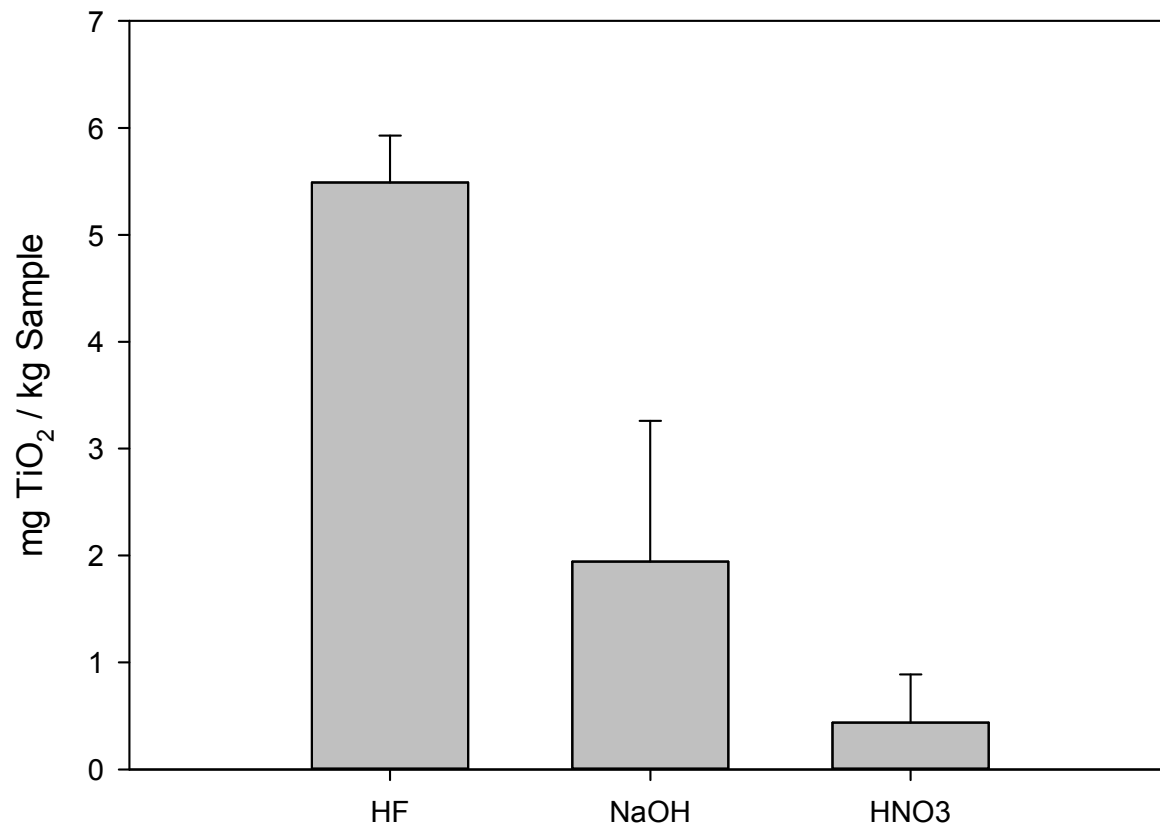


Figure SI 1) Comparison of different digestion methods for recovering TiO<sub>2</sub> from nematodes: HF – (combination of hydrofluoric acid and nitric acid), NaOH: sodium hydroxide and HNO<sub>3</sub>: nitric acid digestion.

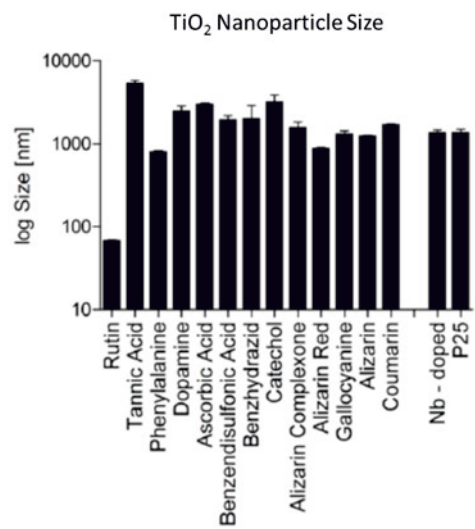
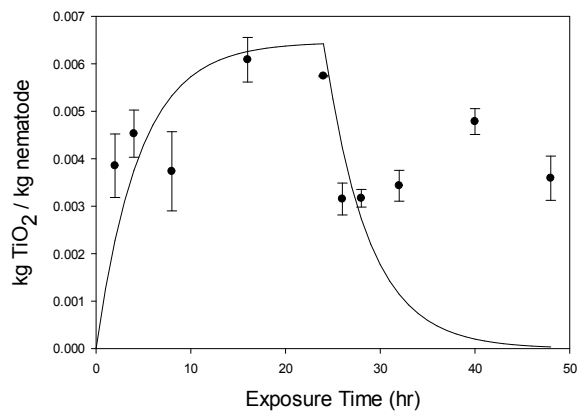
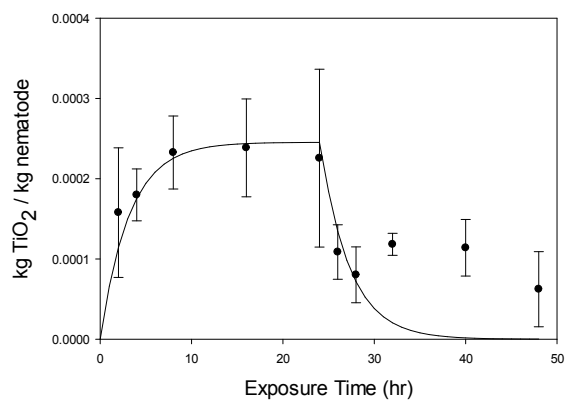
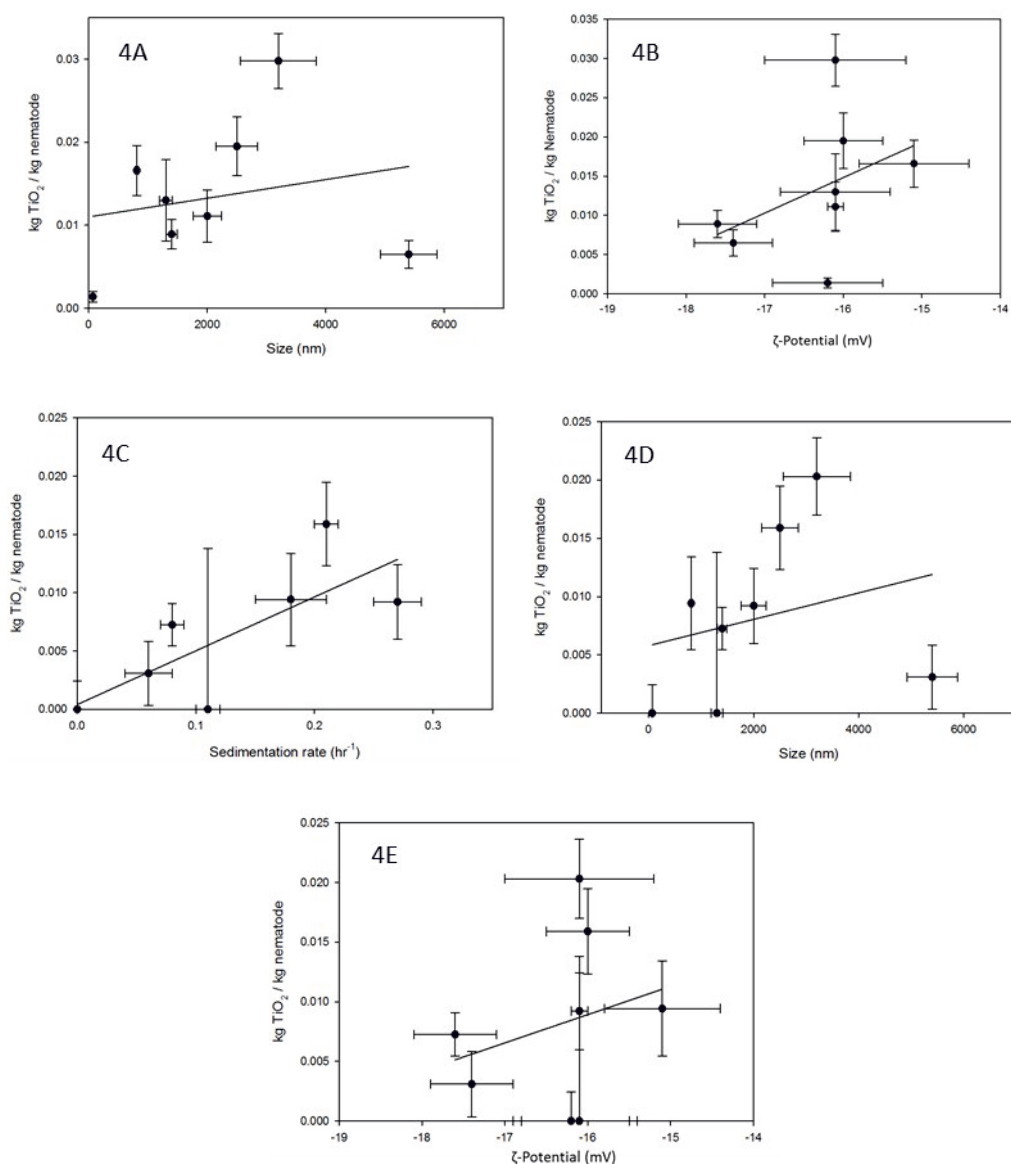


Figure SI 2) Coated TiO<sub>2</sub> nanoparticle sizes in Chriesbach River water.<sup>1</sup>



**Figure SI 3)** Uptake and elimination of TiO<sub>2</sub> NP (data as in Figure 1 B and C) modeled with single elimination phase.



**Figure SI 2)** Uptake of surface functionalized  $\text{TiO}_2$  NPs by the nematode *Plectus aquatilis* ( $n=3 \pm$  standard deviation): A) Poor of correlation between  $\text{TiO}_2$  associated with the nematode and  $\text{TiO}_2$  aggregate size ( $r=0.21$ ), B) Poor of correlation between  $\text{TiO}_2$  NP  $\zeta$ -potential and  $\text{TiO}_2$  associated with the nematode ( $r=0.42$ ), and C) Good correlation between  $\text{TiO}_2$  internalized by the nematode and  $\text{TiO}_2$  NP sedimentation rate ( $r=0.75$ ), D) Poor of correlation between  $\text{TiO}_2$  internalized by the nematode and  $\text{TiO}_2$  aggregate size ( $r=0.26$ ), and E) Poor of correlation between  $\text{TiO}_2$  internalized by the nematode and  $\text{TiO}_2$  NP  $\zeta$ -potential ( $r=0.26$ ) (for C-E, average internalization of rutin and gallicyanine coated  $\text{TiO}_2$  NP less than the attached  $\text{TiO}_2$  content internalized,  $\text{TiO}_2$  content set to zero).



**Text SI 1) DNA barcodes for the nematode *Plectus aquatilis*.**

Plectus\_aquatilus\_LSU

TGAAACACGGACCAAGGAGTCTAACATGTGCGGAGTCATTGGGTGTCAAACCTAAAGGCGGAATGAAAGTGAA  
GATCGGCTCGACCGGTTGATATGGGATCCGTTCCGGTCACGGCCGAGCGGCGCACCATAGCCCCGTCTCGACTGCT  
TGCAGTGGGGCGGAGGCAGAGCGTACACGTTGGGACCCGAAAGATGGTGAACCTATGCCTGAGCAGGACGAAGC  
CAGAGGAAACTCTGGTGGAGGTCCGAAGCGGTTCTGACGTGCAAATCGATCGTCAGACTTGGGTATAGGGGCGA  
AAGACTAATCGAACCATCTAGTAGCTGGTCCCTCTGAAGTTCCCCCAGGATAGCTGGAGCTCTTTAGAGCAGTT  
GTATCCGGTAAAGCGAATGATTAGAGGCCTTGGGGACGAAACGACCTCAACCTATTCTCAAACCTTCAATGGGTAC  
GAAGTCCCGGTTGCTTGACTCGAACCGACGGACAGTGAATGTGAGCTCCAAGTGGGCCATTTTTGGTAAGCA

Plectus\_aquatilus\_SSU

CGAATATGGTGAAGCCGCGAATGGCTCATTACAACAGCCACTGTTTACTTGATCTTGATTATCCTACTTGGATAACT  
GTGGTAATTCTAGAGCTAATACACGCAATAAAGCTCCGACCTTACGGGACGAGCGCATTATTAGACCAAACCAA  
TCGGGCTTCGGCCTGAACGGTGGTGAAGTCTGAATAACTGAGCTGATCGCATGGTCTTTGTACCGGCGACGCATCTT  
TCAAGTGTCTGCCTTATCAACTTTCGATGGTAGTTTATGTGCCTACCATGGTTGTTACGGGTAACGGGAGAATAAGG  
GTTTCGACTCCGGAGAGGGAGCCTGAGAAACGGCTACCACATCCAAGGAAGGCAGCAGGCGCGCAAATTACCCAC  
TCTCGGCACGAGGAGGTAGTGACGAAAAATAACGAGGCGGTTCTCTAAGAGGCCCGCTATCGGAATGGGTACAA  
TTTAAACCCTTAAACGAGGACCTATGAGAGGGCAAGTCTGGTGCCAGCAGCCGCGGTAATTCCAGCTCTCAAGGT  
GTATATCGCCATTGCTGCGGTTAAAAAGCTCGTAGTTGGATCTGCGCCTTCGGACTCGGTCCGCCAACGGGTGTG  
AACTGAGATCCAAGGCTTATACTGCTGGTTTTCCCTTGATGCTCTTCACTGGGTGTCTTGGGTGGCTAGCGAGTTTA  
CTTTGAAAAAATTAGAGTGCTTAAACACAGGCTATCGCCTGAATACTTGTGCATGGAATAATAGAATAAGACCACGG  
CTCTATTTTATTGGTTTTTCGGAAGTGTGATAATGGTTAAGAGGGACAGACGGGGGCATTCGTATCGCT

**Text SI 2) Separation of nematodes from growth media on sucrose gradients.**

Nematodes were pelleted from the growth media by centrifugation. The nematodes were then suspended in 60 % ice cold sucrose and then centrifuged at 800 g for 20 minutes. After separation the nematodes were washed 3 times with culture media to remove excess sucrose solution. The nematodes were then allowed to recover overnight, before nanoparticle exposures were conducted.

1. H. Schug, C. W. Isaacson, L. Sigg, A. Amman and K. Schirmer, *Environ. Sci. Technol.*, 2014, **48**, 11620-11628.