

## Surface modification of magnetite nanoparticles by bacteriophages and ionic liquids precursors

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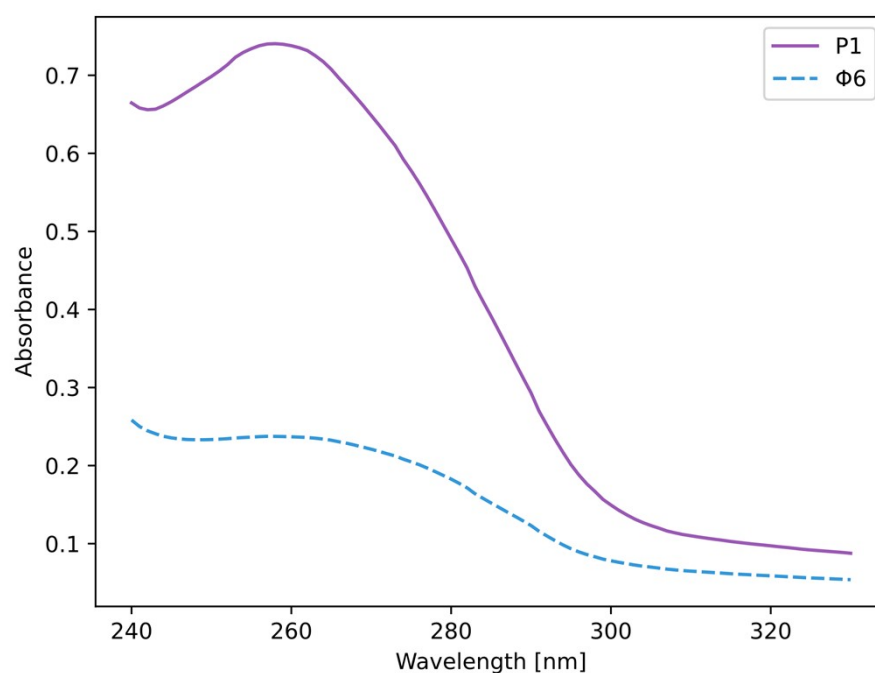


Figure S1. UV-Vis spectra of stock phage suspensions used during experiments.

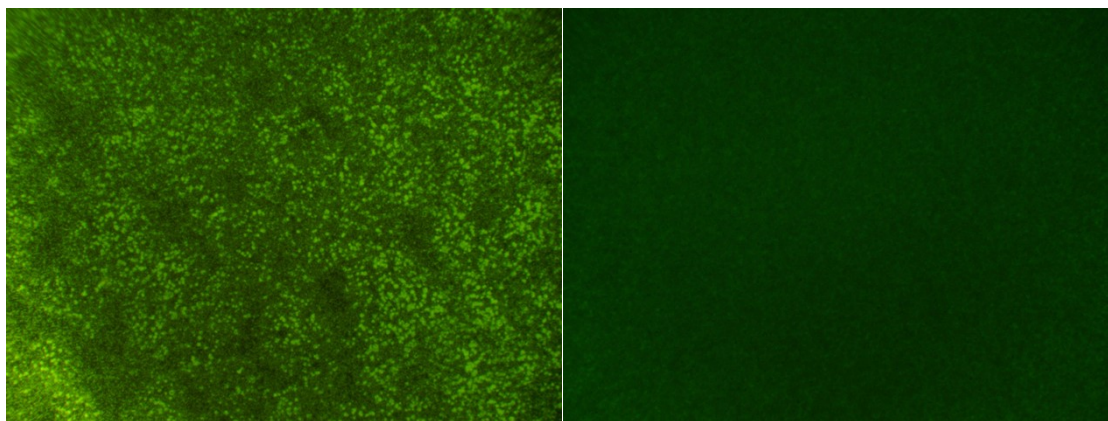


Figure S2. Epifluorescence microscopy images of phage suspensions. SybrGold® stained, *Escherichia* phage P1 (left) and *Pseudomonas* phage Φ6 (right). There are no bacterial debris visible. Both bacteriophages are agglomerated due to the high density of bacteriophages in the suspensions.

Table S1. Unit cell parameters of the studied MNPs based on the XRD measurements.

Pos. [°2Th.]	d-spacing [Å]	Height [cts]	h	k	l	FWHM Left [°2Th.]	Shape Left	Integral Breadth [°2Th.]	Area [cts*°2Th.]	Backgr.[cts]	Crystallite Sizeonly [Å]	Crystallite Sizeonly [nm]	Micro Strain only [%]
<b>Magnetic NP without modification</b>													
18.27	4.85194	50(14)	1	1	1	1.3097	1.119	1.914425	96.28	225.68	48.13765	4.813765	5.039656
30.1376	2.96293	196(59)	0	2	2	1.2588	1.131	2.760594	540.49	124.46	34.19281	3.419281	4.332686
35.5227	2.52513	694(120)	1	1	3	1.2324	1.137	2.065808	1433.52	106.71	46.76094	4.676094	2.700045
43.2034	2.09234	153(44)	0	0	4	1.1905	1.144	1.900274	290.44	100.15	52.24019	5.224019	2.002614
53.6373	1.70734	69(23)	2	2	4	1.1225	1.155	1.847543	127.63	105.81	56.07459	5.607459	1.522387
57.1896	1.60944	172(42)	1	1	5	1.0957	1.159	1.77943	305.96	106.54	59.29403	5.929403	1.357171
62.8204	1.47804	321(71)	0	4	4	1.0481	1.165	1.77899	571.88	101.73	61.06222	6.106222	1.210276
71.3004	1.32164	28(12)	0	2	6	0.9612	1.173	1.741996	48.2	70.77	65.66728	6.566728	1.006317
74.3638	1.2746	67(31)	3	3	5	0.9238	1.176	1.745789	116.29	49.74	66.87443	6.687443	0.952978
<b>Magnetic NP with P1 phage</b>													
18.297	4.84484	48(15)	1	1	1	1.3722	1.116	1.932163	92.86	174.55	47.31034	4.731034	5.120279
30.1579	2.96098	188(63)	0	2	2	1.3149	1.126	2.835107	532.66	75.33	33.27146	3.327146	4.449733
35.5399	2.52395	668(126)	1	1	3	1.2839	1.131	2.185768	1460.35	62.91	44.10638	4.410638	2.861208
43.2159	2.09176	148(48)	0	0	4	1.2328	1.137	2.049588	303.72	66.19	48.29327	4.829327	2.165685
53.6431	1.70717	68(24)	2	2	4	1.1461	1.146	1.836166	124.85	85.01	56.43837	5.643837	1.512423
57.193	1.60936	171(43)	1	1	5	1.1106	1.149	1.74119	296.97	89.09	60.81572	6.081572	1.323141
62.8197	1.47806	324(72)	0	4	4	1.0459	1.154	1.732293	561.45	87.37	62.78482	6.278482	1.177081
71.2931	1.32176	29(14)	0	2	6	0.9214	1.161	1.741131	50.6	53.86	65.69839	6.569839	1.005929
74.354	1.27474	72(34)	3	3	5	0.865	1.164	1.679986	120.35	29.18	69.62223	6.962223	0.915469
<b>Magnetic NP with Φ 6 phage</b>													
18.2994	4.8442	55(15)	1	1	1	1.2784	1.116	1.803838	99.15	205.25	50.8182	5.08182	4.766202
30.1616	2.96063	214(64)	0	2	2	1.2294	1.126	2.676039	572.92	99.58	35.30613	3.530613	4.192802
35.5441	2.52366	759(128)	1	1	3	1.2046	1.131	2.035182	1544.03	83.43	47.49411	4.749411	2.656814
43.221	2.09153	167(49)	0	0	4	1.1656	1.138	1.905422	318.13	81.24	52.0965	5.20965	2.007358
53.6493	1.70699	75(25)	2	2	4	1.1038	1.147	1.754699	131.96	93.58	59.17793	5.917793	1.442251
57.1997	1.60918	187(45)	1	1	5	1.0798	1.15	1.72266	321.88	95.99	61.34118	6.134118	1.311666
62.8272	1.4779	348(74)	0	4	4	1.0378	1.155	1.716545	597.18	92.48	63.39055	6.339055	1.165709
71.3017	1.32162	30(13)	0	2	6	0.9626	1.162	1.764656	52.28	58.83	64.78459	6.478459	1.020011
74.3631	1.27461	71(35)	3	3	5	0.9308	1.165	1.784553	126.52	35.02	65.35214	6.535214	0.975184

Table S2. Electrokinetic potential measurements. Scheffé test; \*\*\*\* indicates belonging to a homogeneous group. Dunnett's test; red marked p-values indicate statistical differences (at  $p < 0.05$ ).

<i>Scheffé</i>	1	2	3	4	5	6	7	8	9	10	<i>Dunnett</i>	NP	NP/P1	NP/ $\Phi$ 6
NP	****	****									NP	-	0.000	1.000
NP/P1				****	****	****					NP/P1	0.000	-	0.000
NP/ $\Phi$ 6	****	****									NP/ $\Phi$ 6	0.898	0.000	-
NP/OH		****	****	****							NP/OH	0.000	0.001	0.000
NP/OH/P1	****	****	****								NP/OH/P1	0.004	0.000	0.021
NP/OH/ $\Phi$ 6					****	****	****	****			NP/OH/ $\Phi$ 6	0.000	0.363	0.000
NP/C8					****	****	****	****	****		NP/C8	0.000	0.006	0.000
NP/C8/P1								****	****	****	NP/C8/P1	0.000	0.000	0.000
NP/C8/ $\Phi$ 6							****	****	****	****	NP/C8/ $\Phi$ 6	0.000	0.000	0.000
NP/C10				****	****	****	****				NP/C10	0.000	0.997	0.000
NP/C10/P1				****	****	****	****	****			NP/C10/P1	0.000	0.722	0.000
NP/C10/ $\Phi$ 6	****	****	****								NP/C10/ $\Phi$ 6	0.008	0.000	0.039
NP/C12									****	****	NP/C12	0.000	0.000	0.000
NP/C12/P1				****	****	****	****				NP/C12/P1	0.000	0.933	0.000
NP/C12/ $\Phi$ 6						****	****	****	****		NP/C12/ $\Phi$ 6	0.000	0.000	0.000
NP/C14							****	****	****	****	NP/C14	0.000	0.000	0.000
NP/C14/P1	****										NP/C14/P1	1.000	0.000	0.518
NP/C14/ $\Phi$ 6							****	****	****	****	NP/C14/ $\Phi$ 6	0.000	0.000	0.000
NP/C16					****	****	****	****	****		NP/C16	0.000	0.007	0.000
NP/C16/P1			****	****	****						NP/C16/P1	0.000	0.680	0.000
NP/C16/ $\Phi$ 6			****	****	****						NP/C16/ $\Phi$ 6	0.000	0.630	0.000
NP/C18										****	NP/C18	0.000	0.000	0.000
NP/C18/P1					****	****	****	****	****		NP/C18/P1	0.000	0.010	0.000
NP/C18/ $\Phi$ 6						****	****	****	****		NP/C18/ $\Phi$ 6	0.000	0.000	0.000

Table S3. Loss of viability of *E. coli*. Scheffé test; \*\*\*\* indicates belonging to a homogeneous group.

Free living				On surface				
Scheffé	1	2	3	Scheffé	1	2	3	4
Control	****							
NP	****			NP	****			
NP/P1	****			NP/P1	****	****		
NP/ $\phi$ 6	****			NP/ $\phi$ 6	****			
NP/OH	****			NP/OH	****			
NP/P1/OH	****			NP/P1/OH	****			
NP/ $\phi$ 6/OH	****			NP/ $\phi$ 6/OH	****			
NP/C8	****			NP/C8	****			
NP/P1/C8	****			NP/P1/C8	****			
NP/ $\phi$ 6/C8	****			NP/ $\phi$ 6/C8	****			
NP/C10	****			NP/C10	****			
NP/P1/C10	****			NP/P1/C10	****			
NP/ $\phi$ 6/C10	****			NP/ $\phi$ 6/C10	****			
NP/C12	****			NP/C12	****			
NP/P1/C12	****			NP/P1/C12	****			
NP/ $\phi$ 6/C12	****			NP/ $\phi$ 6/C12	****			
NP/C14	****			NP/C14	****			
NP/P1/C14	****			NP/P1/C14	****			
NP/ $\phi$ 6/C14	****			NP/ $\phi$ 6/C14		****		
NP/C16	****			NP/C16	****			
NP/P1/C16		****		NP/P1/C16				****
NP/ $\phi$ 6/C16		****		NP/ $\phi$ 6/C16				****
NP/C18		****		NP/C18			****	
NP/P1/C18			****	NP/P1/C18			****	
NP/ $\phi$ 6/C18			****	NP/ $\phi$ 6/C18				****

Table S4. Loss of viability of *B. cereus*. Scheffé test; \*\*\*\* indicates belonging to a homogeneous group.

Free living						On surface					
Scheffé	1	2	3	4	5	Scheffé	1	2	3	4	5
Control	****										
NP	****					NP	****				
NP/P1	****					NP/P1	****	****			
NP/ $\phi$ 6	****					NP/ $\phi$ 6	****	****			
NP/OH	****					NP/OH	****	****			
NP/P1/OH	****	****				NP/P1/OH	****	****			
NP/ $\phi$ 6/OH	****	****				NP/ $\phi$ 6/OH	****	****			
NP/C8	****					NP/C8	****	****			
NP/P1/C8	****	****				NP/P1/C8	****	****			
NP/ $\phi$ 6/C8	****	****	****			NP/ $\phi$ 6/C8	****	****			
NP/C10	****	****				NP/C10	****	****			
NP/P1/C10	****	****				NP/P1/C10	****	****			
NP/ $\phi$ 6/C10	****	****	****			NP/ $\phi$ 6/C10	****	****			
NP/C12	****	****				NP/C12	****	****			
NP/P1/C12	****	****				NP/P1/C12	****	****			
NP/ $\phi$ 6/C12	****	****				NP/ $\phi$ 6/C12	****	****			
NP/C14	****	****				NP/C14	****	****			
NP/P1/C14	****					NP/P1/C14	****	****			
NP/ $\phi$ 6/C14	****	****	****			NP/ $\phi$ 6/C14		****			
NP/C16		****	****	****		NP/C16			****	****	****
NP/P1/C16			****	****		NP/P1/C16			****	****	
NP/ $\phi$ 6/C16				****		NP/ $\phi$ 6/C16			****	****	****
NP/C18				****		NP/C18			****		
NP/P1/C18					****	NP/P1/C18				****	****
NP/ $\phi$ 6/C18					****	NP/ $\phi$ 6/C18					****