

## Supporting Information

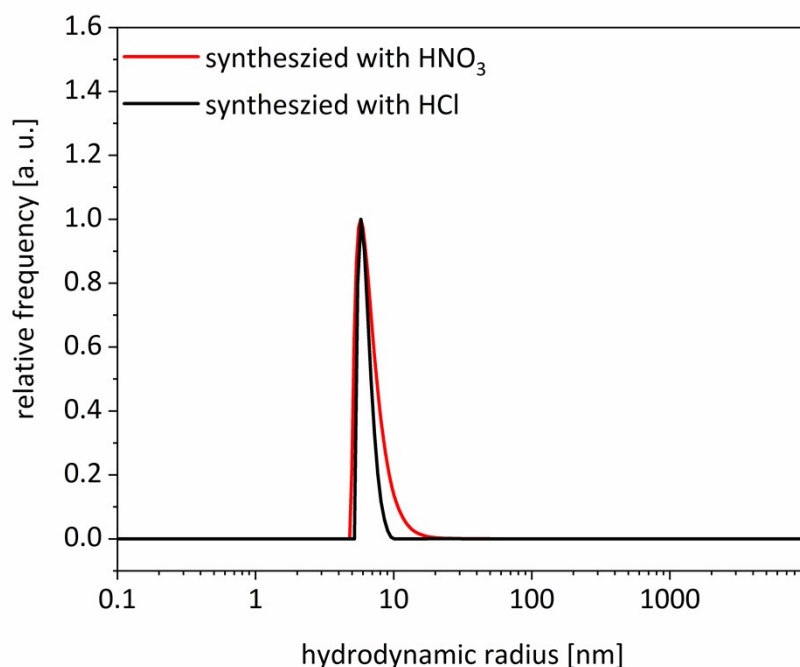
# Amphiphilic Titania Janus Nanoparticles Containing Ionic Groups prepared in Oil-Water Pickering Emulsion

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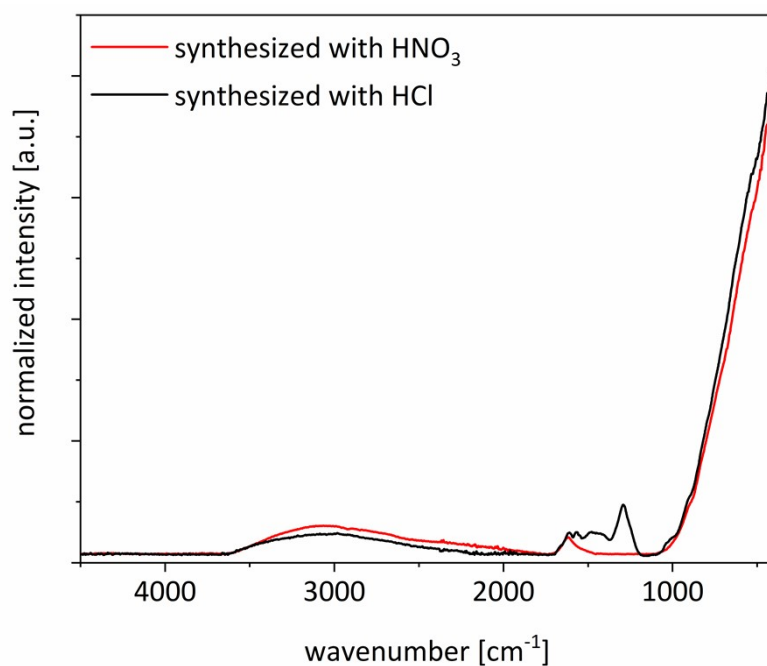
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Saarbrücken, Germany

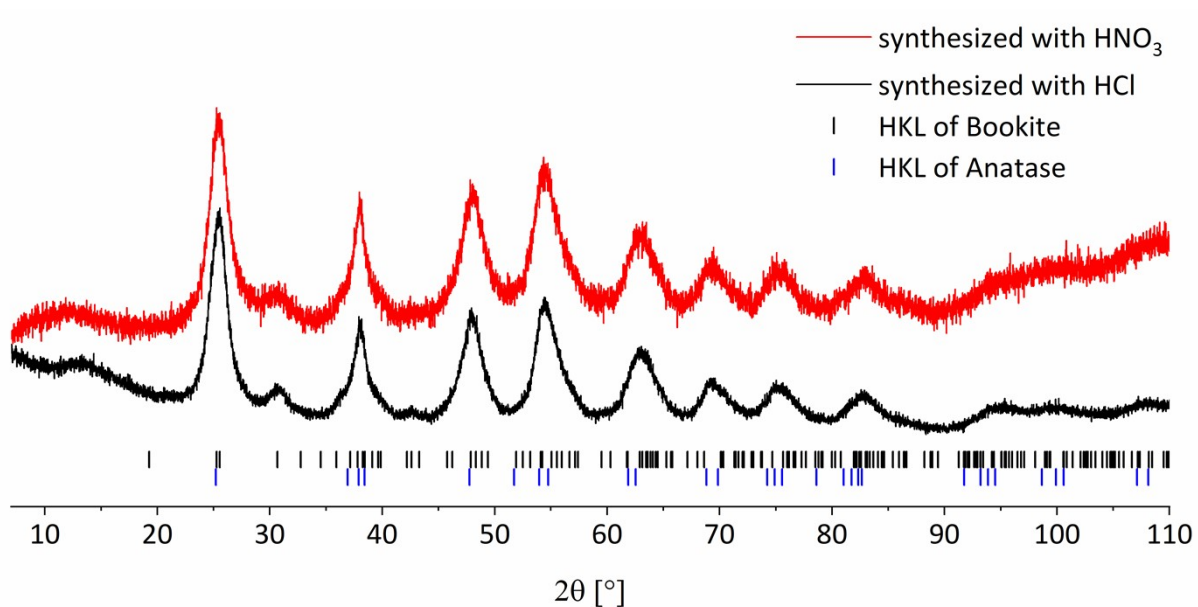
E-mail: [guido.kickelbick@uni-saarland.de](mailto:guido.kickelbick@uni-saarland.de)



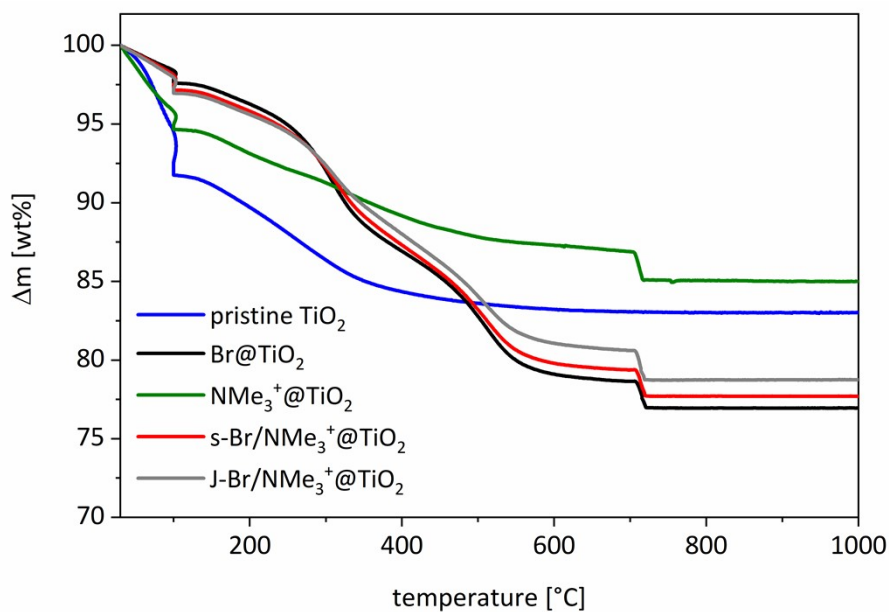
**Figure S1:** Number weighted DLS of titania particles dispersed in water, synthesized with aq. HNO<sub>3</sub> (red) and aq. HCl (black).



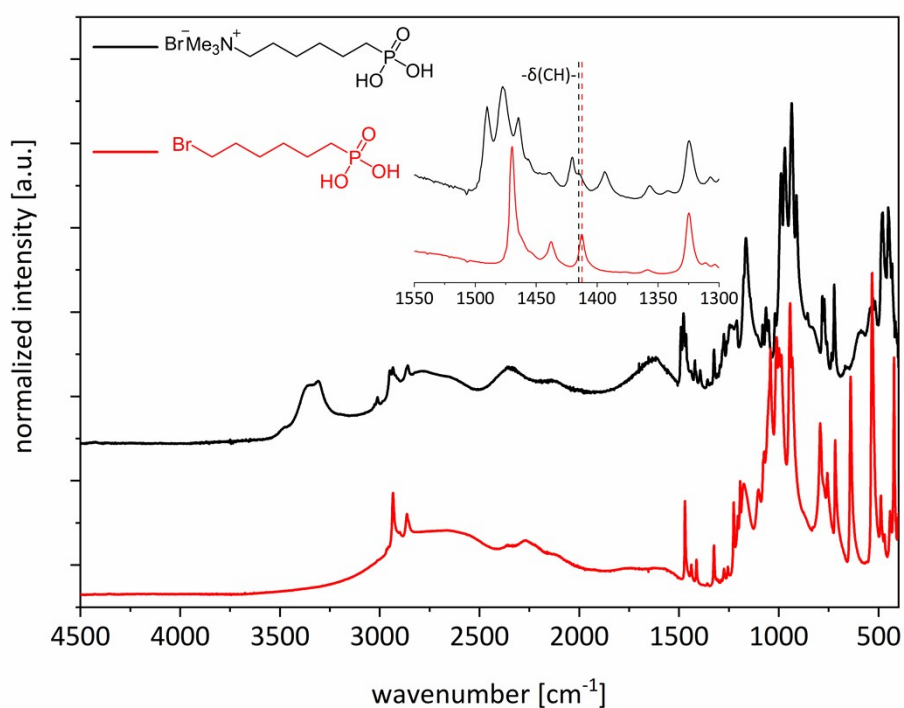
**Figure S2:** FTIR spectra of titania nanoparticles synthesized with aq.  $\text{HNO}_3$  (red) and aq.  $\text{HCl}$  (black).



**Figure S3:** XRD of titania particles synthesized with aq.  $\text{HNO}_3$  (black) and aq.  $\text{HCl}$  (red).



**Figure S4:** TGA curves from 30 °C to 1000 °C.



**Figure S5:** FTIR spectra of 6-Bromohexylphosphonic acid (BrC<sub>6</sub>PA, red) and *N,N,N*-trimethyl-6-phosphonohexan-1-aminium bromide (NMe<sub>3</sub><sup>+</sup>C<sub>6</sub>PA, black).

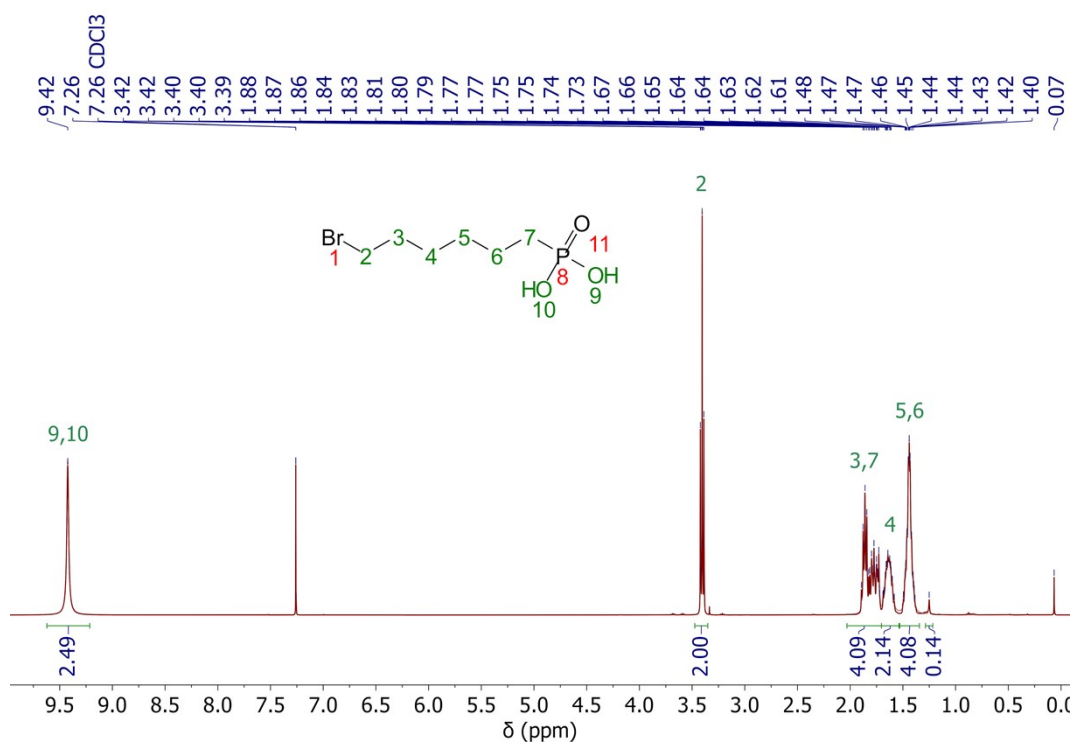


Figure S6: <sup>1</sup>H NMR spectrum of BrC<sub>6</sub>PA.

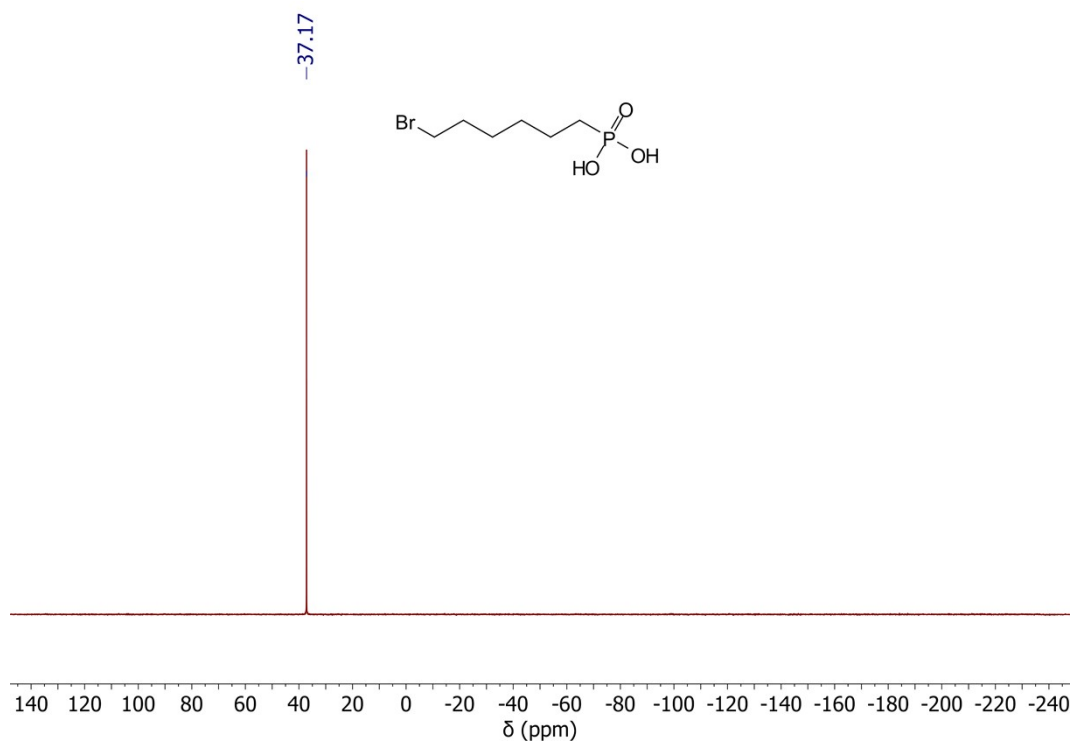


Figure S7: <sup>31</sup>P NMR spectrum of BrC<sub>6</sub>PA.

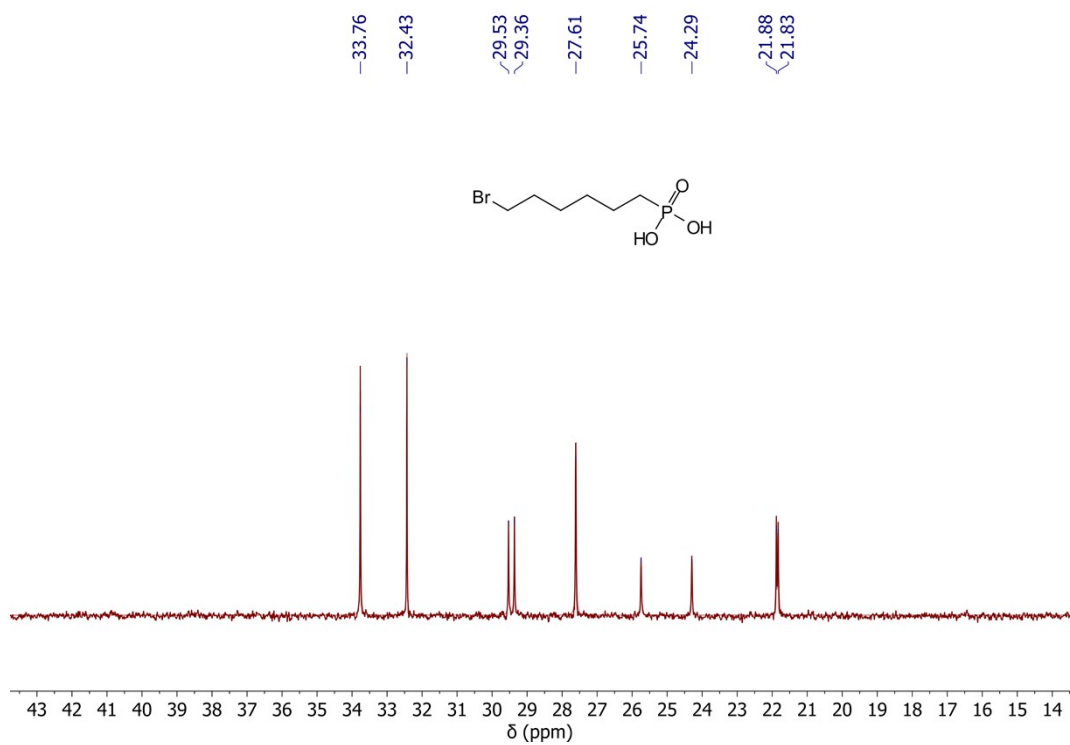


Figure S8: <sup>13</sup>C NMR spectrum of BrC<sub>6</sub>PA.

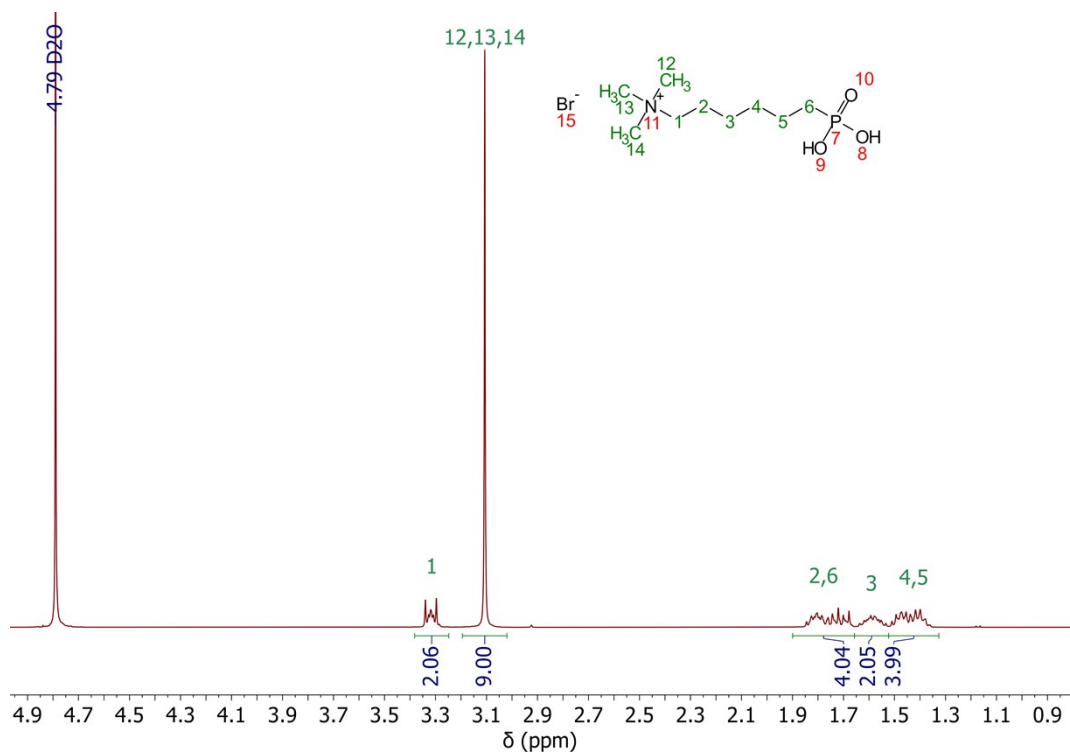
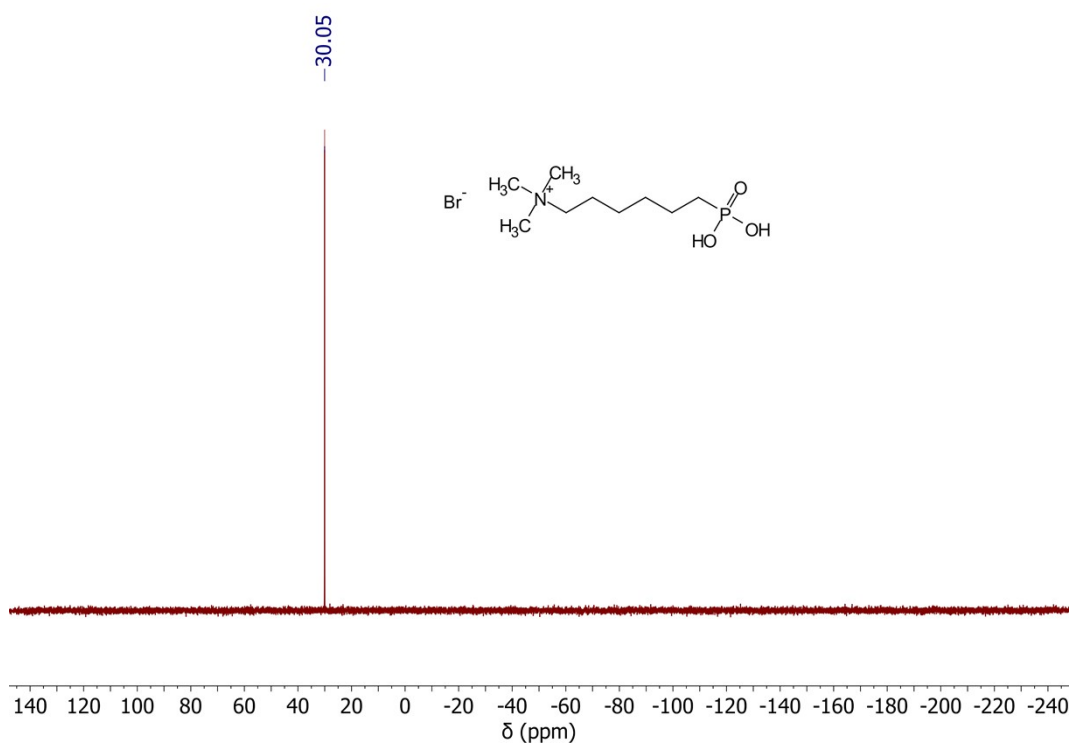
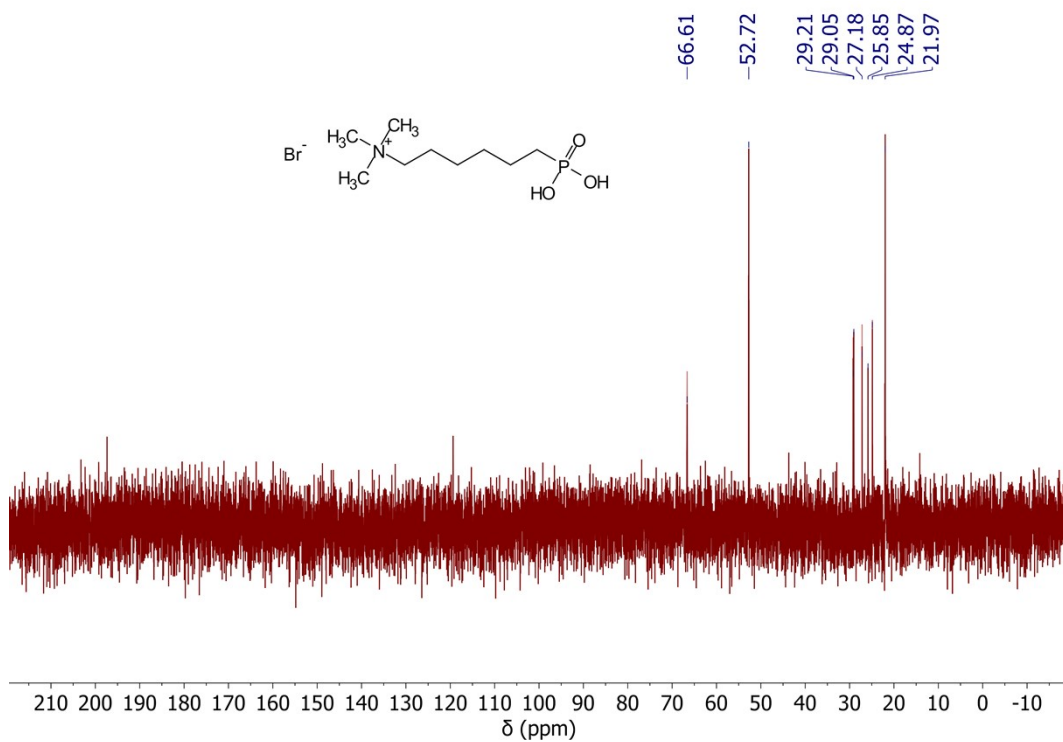


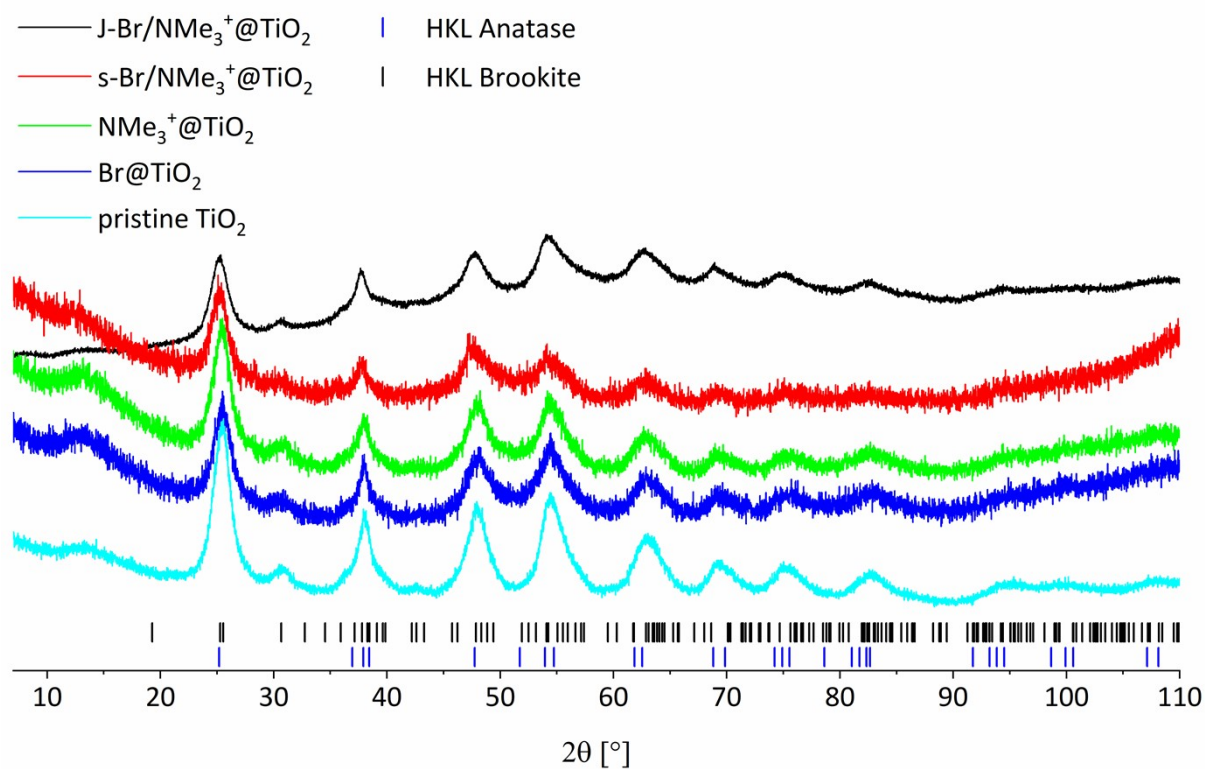
Figure S9: <sup>1</sup>H NMR spectrum of NMe<sub>3</sub><sup>+</sup>C<sub>6</sub>PA.



**Figure S 10:**  $^{31}\text{P}$  NMR spectrum of  $\text{NMe}_3^+\text{C}_6\text{PA}$ .



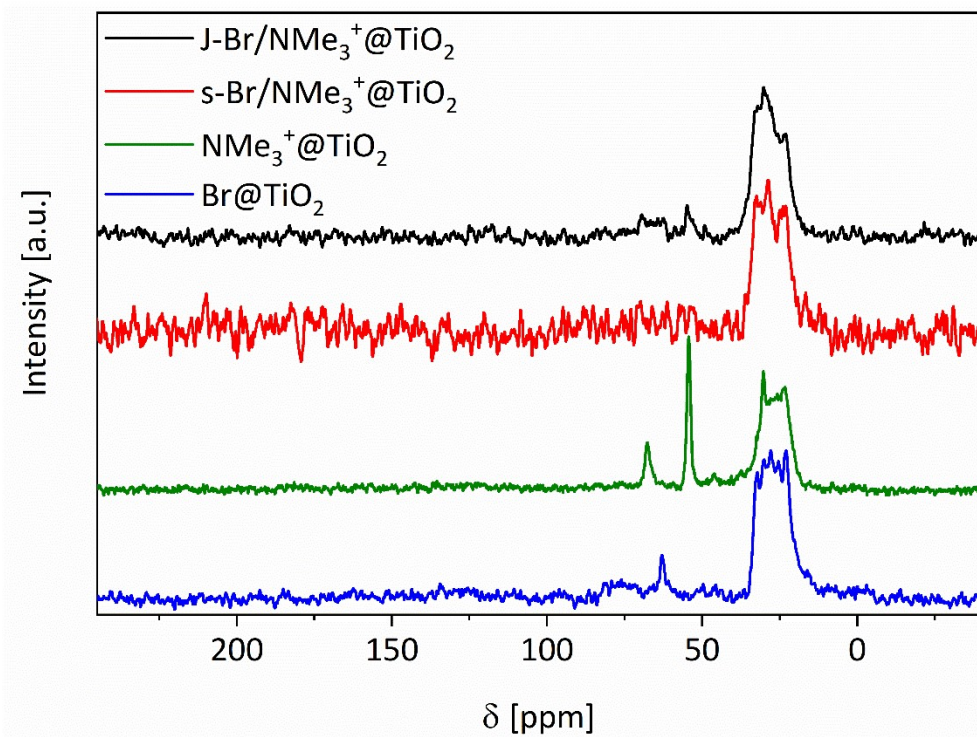
**Figure S11:**  $^{13}\text{C}$  NMR spectrum of  $\text{NMe}_3^+\text{C}_6\text{PA}$ .



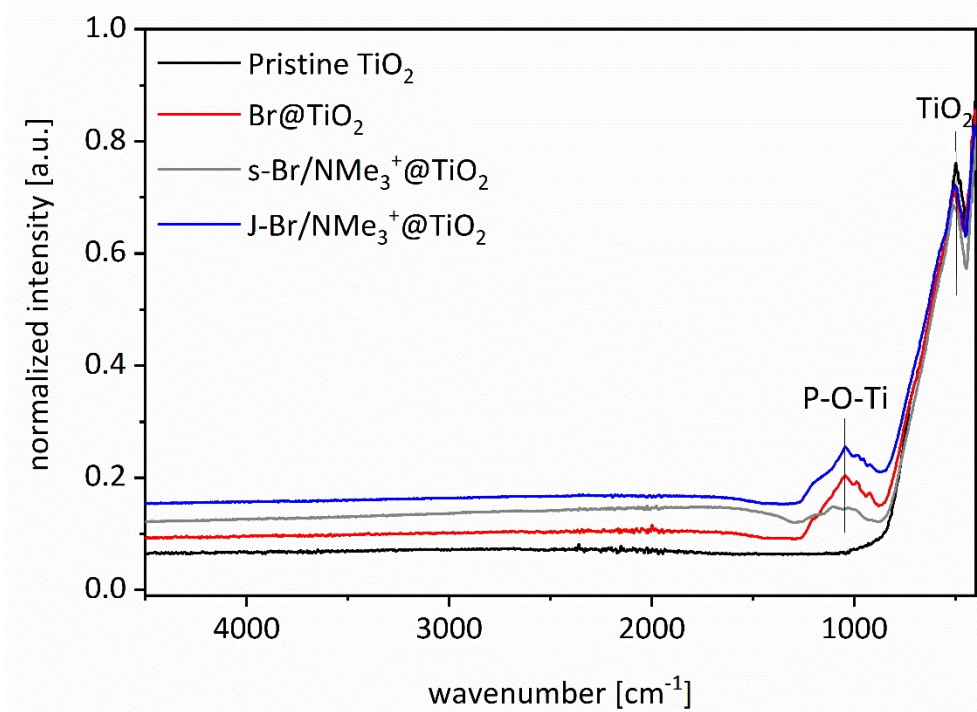
**Figure S12:** PXRD pattern of pristine and modified TiO<sub>2</sub> particles with *hkl* ticks for anatase and brookite.

**Table S1:** Chemical shifts from solid-state <sup>31</sup>P CP-MAS NMR.

Sample	<sup>31</sup> P chemical shifts fitted with Gaussian
	[ppm]
BrC <sub>6</sub> PA	32.5
NMe <sub>3</sub> <sup>+</sup> C <sub>6</sub> PA	32.1
Br@TiO <sub>2</sub>	36.5; 29.8; 25.4; 20.3; 17.9
NMe <sub>3</sub> <sup>+</sup> @TiO <sub>2</sub>	35.7; 26.1; 23.8
s-Br/NMe <sub>3</sub> <sup>+</sup> @TiO <sub>2</sub>	34.4; 27.3; 25.6
J-Br/NMe <sub>3</sub> <sup>+</sup> @TiO <sub>2</sub>	31.9; 26.8; 22.0; 13.5

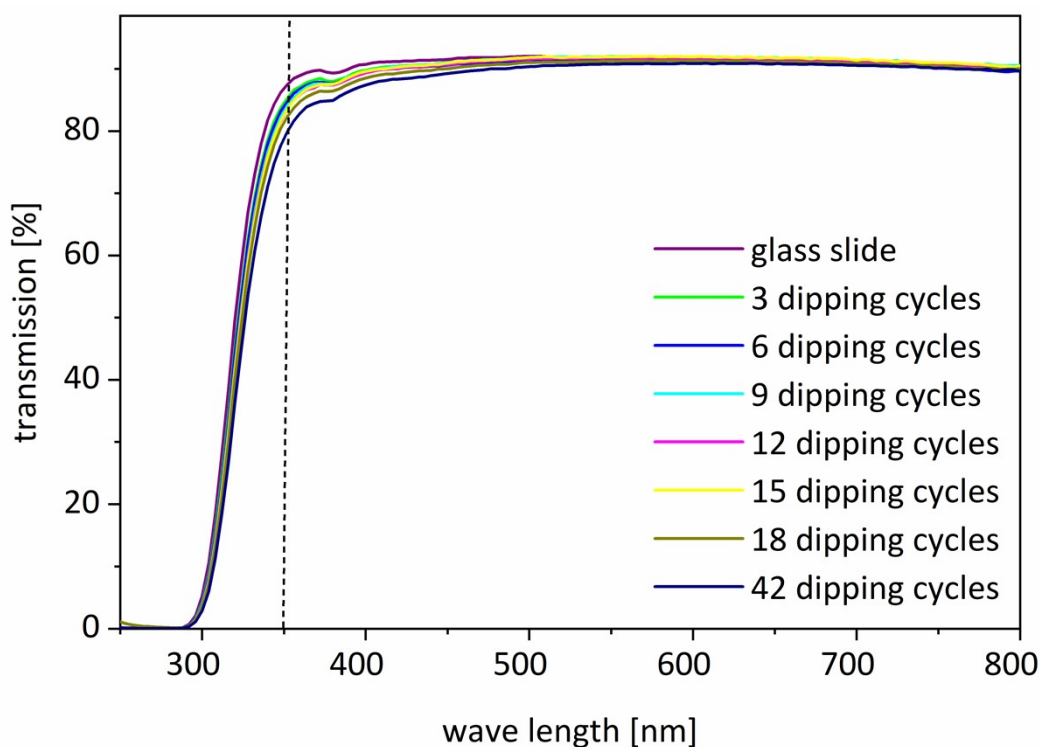


**Figure S13:** Solid-state  $^{13}\text{C}$  CP-MAS NMR spectra of modified titania particles.

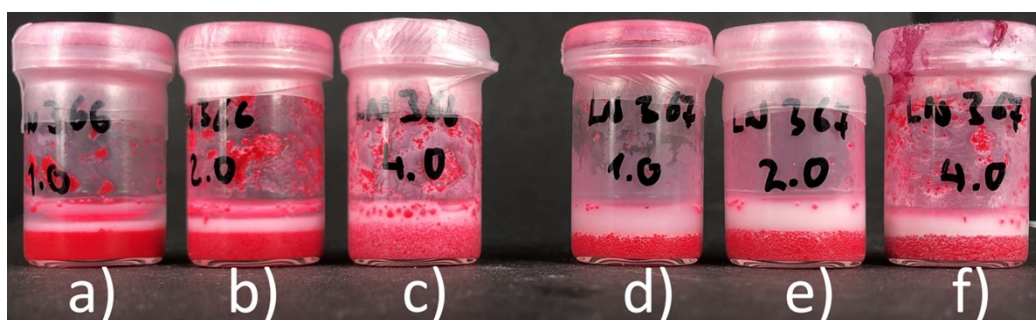


**Figure S14:** FTIR spectra of pristine and modified particles after TGA.

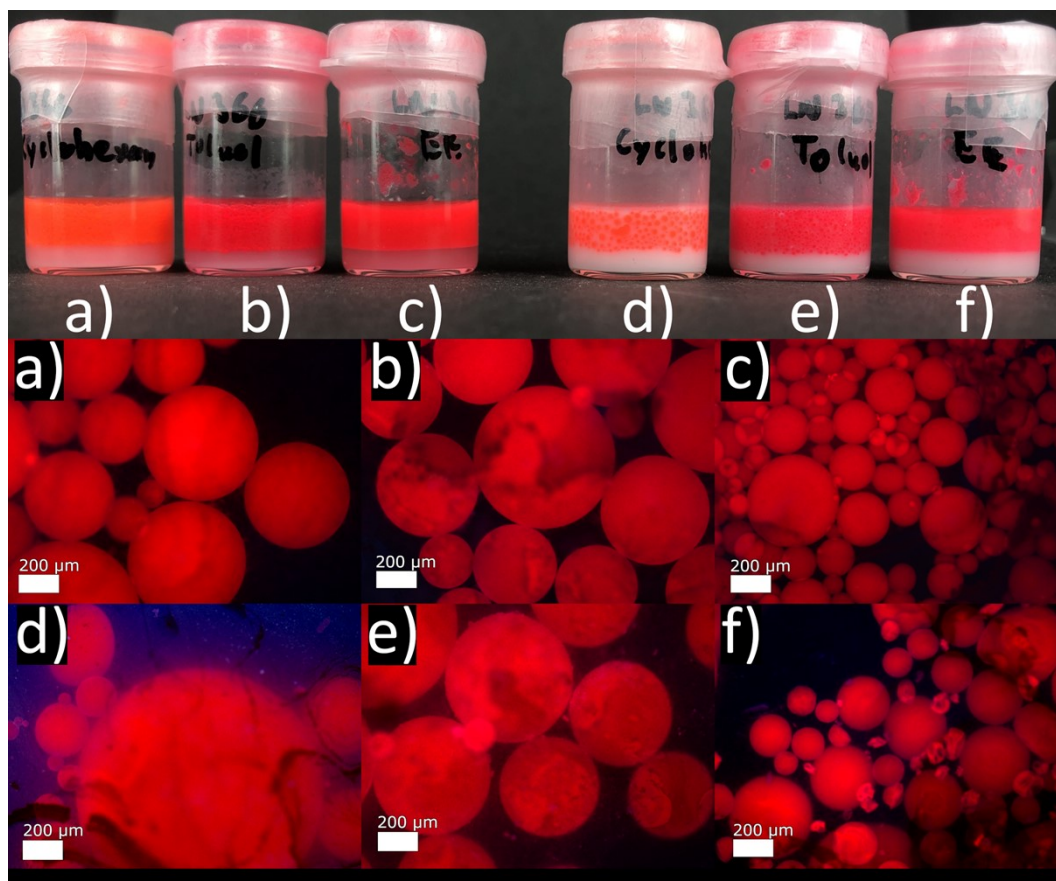




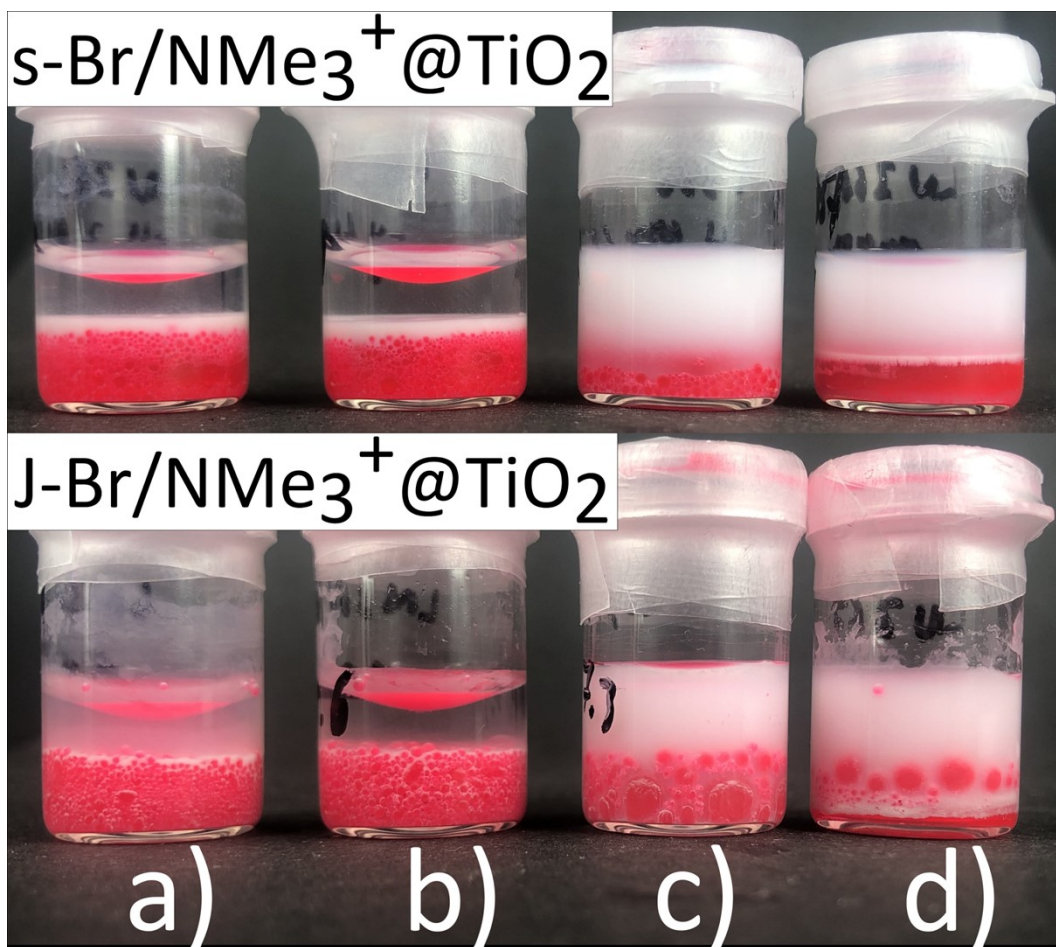
**Figure S15:** UV-Vis spectra of glass slides coated with J-Br/NMe<sub>3</sub><sup>+</sup>@TiO<sub>2</sub>.



**Figure S16:** Photographs of chloroform-water Pickering emulsions with  $\varphi_{\text{oil}} = 50 \text{ vol}\%$  stabilized by statistically modified s-Br/NMe<sub>3</sub><sup>+</sup>@TiO<sub>2</sub> (a - c) and anisotropically modified J-Br/NMe<sub>3</sub><sup>+</sup>@TiO<sub>2</sub> (d - f) with 1.0 wt% (a, d), 2.0 wt% (b, e) and 4.0 wt% (c, f) particle content. Chloroform is coloured with Lumogen Red 305.



**Figure S17:** Photographs and microscopic images of oil-water Pickering emulsions stabilized by J-Br/NMe<sub>3</sub><sup>+</sup>@TiO<sub>2</sub> (a – c) and s-Br/NMe<sub>3</sub><sup>+</sup>@TiO<sub>2</sub> (d – f). As oil phase cyclohexane (a, d), toluene (b, e) and ethylene acetate (c, f) are used. Particle content is 0.8 wt% at pH = 2.5. Volume ratio is  $\phi_{\text{oil}} = 50 \text{ vol}\%$ .



**Figure S18:** Photographs of chloroform-water Pickering emulsions with  $\varphi_{\text{oil}} = 50$  vol% stabilized by statistically modified s-Br/NMe<sub>3</sub><sup>+</sup>@TiO<sub>2</sub> (upper picture) and anisotropically modified J-Br/NMe<sub>3</sub><sup>+</sup>@TiO<sub>2</sub> (lower picture) with a particle content of 0.8 wt% at pH of 2.0 (a), 4.5 (b), 7.0 (c) and 9.0 (d). Chloroform is coloured with Lumogen Red 305.