

# Electronic Supplementary Information

For

Promiscuous Stabilisation Behaviour of Silicic Acid

by Cationic Macromolecules: the Case of

Phosphonium-Grafted Dicationic Ethylene Oxide

Bolaamphiphiles

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## Mass Spectra

### Mass spectrum product PEGP<sup>+</sup> 200

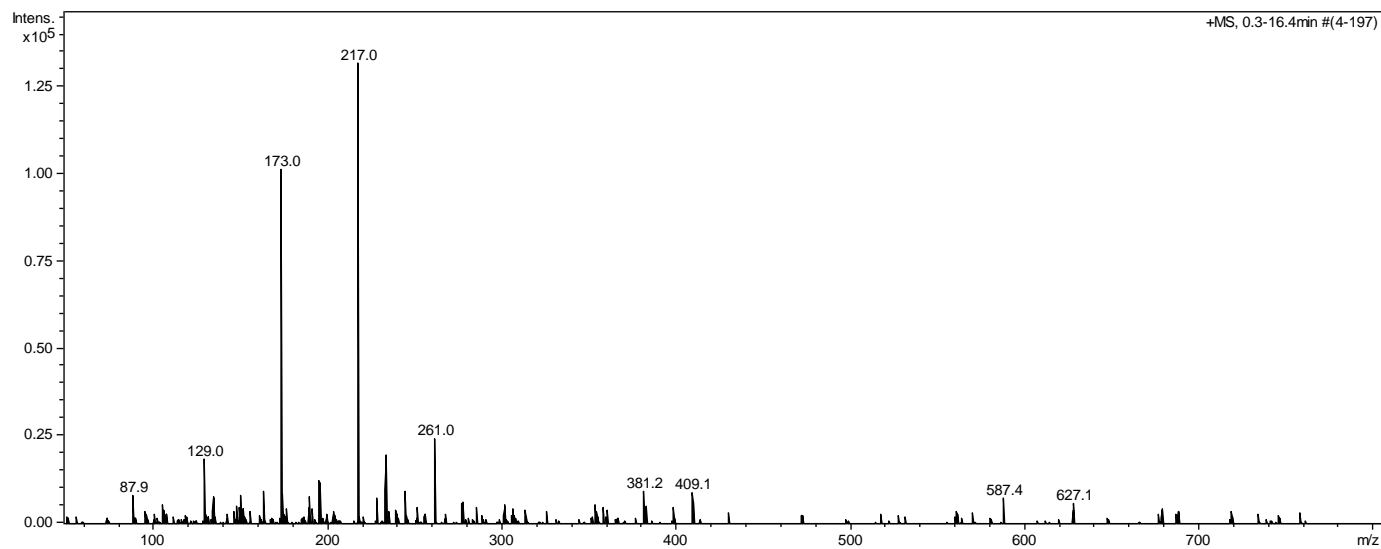


Figure S-1. PEGP<sup>+</sup> 200, MS+: 50-800 m/z

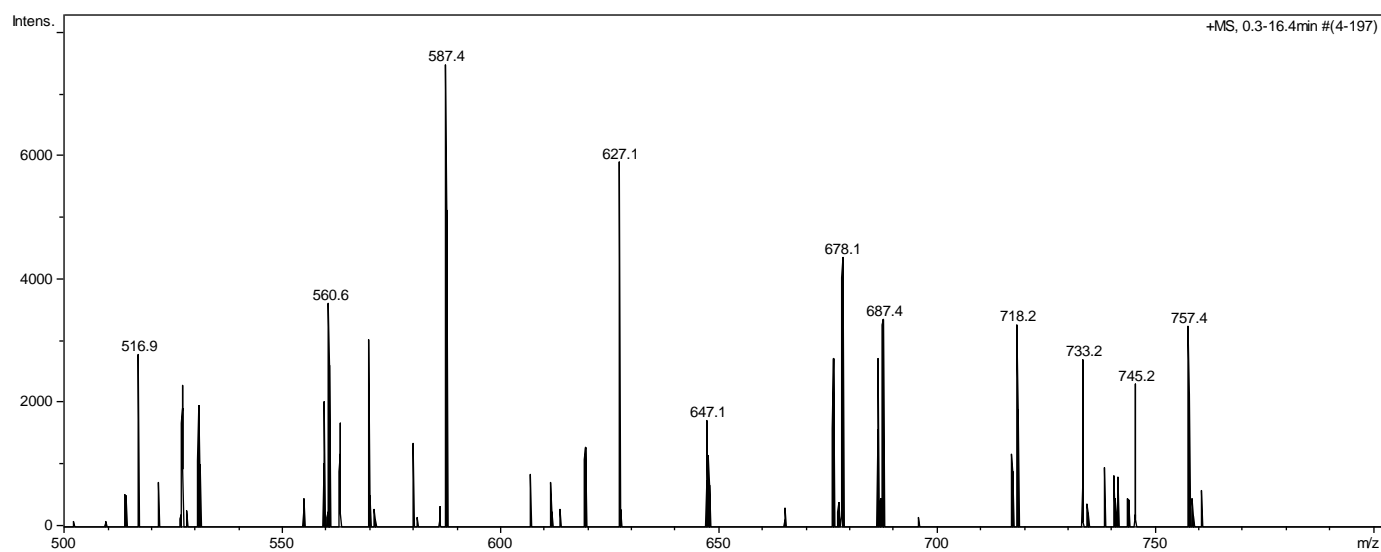


Figure S-2. PEGP<sup>+</sup> 200, MS+: 500-800 m/z

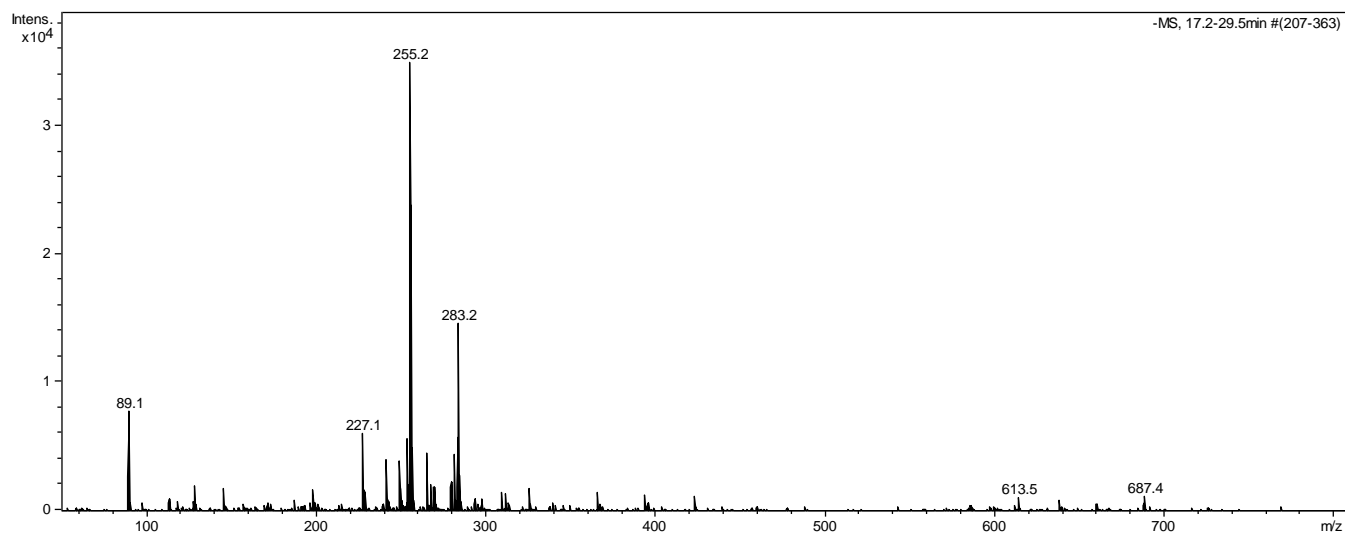


Figure S-3. PEGP<sup>+</sup> 200, MS-: 50-800 m/z

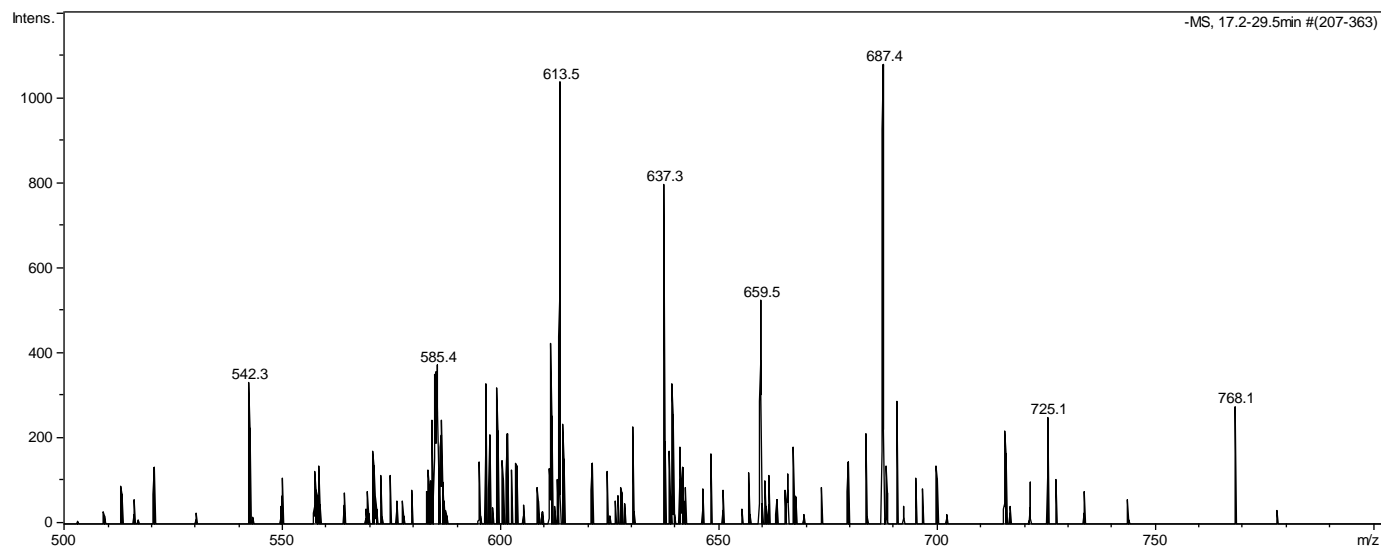
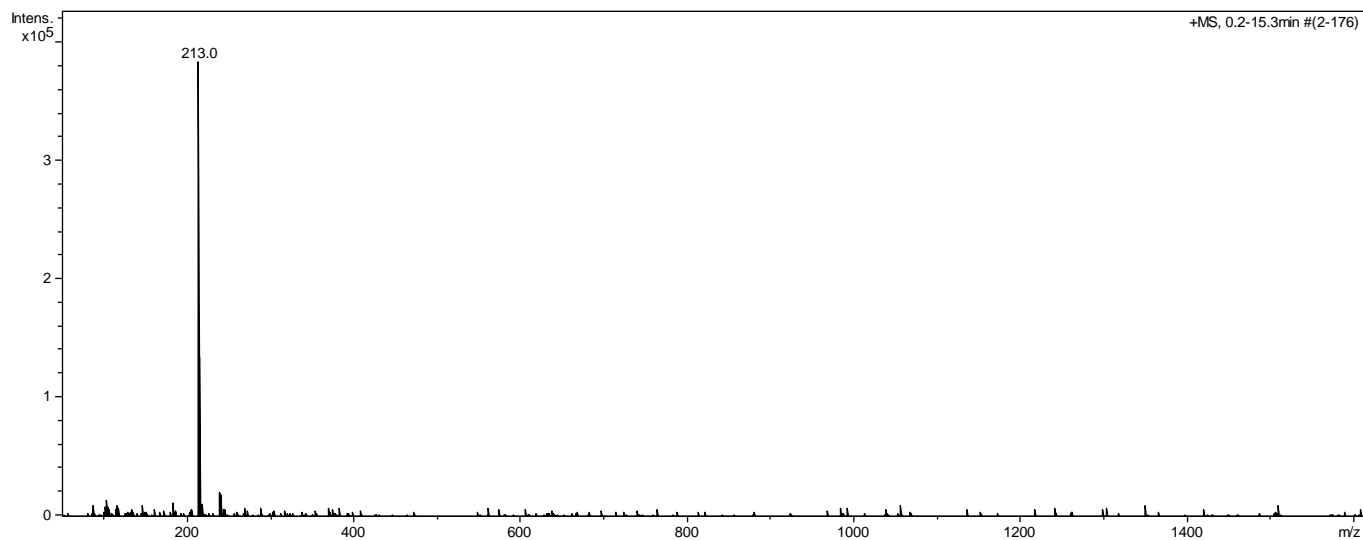
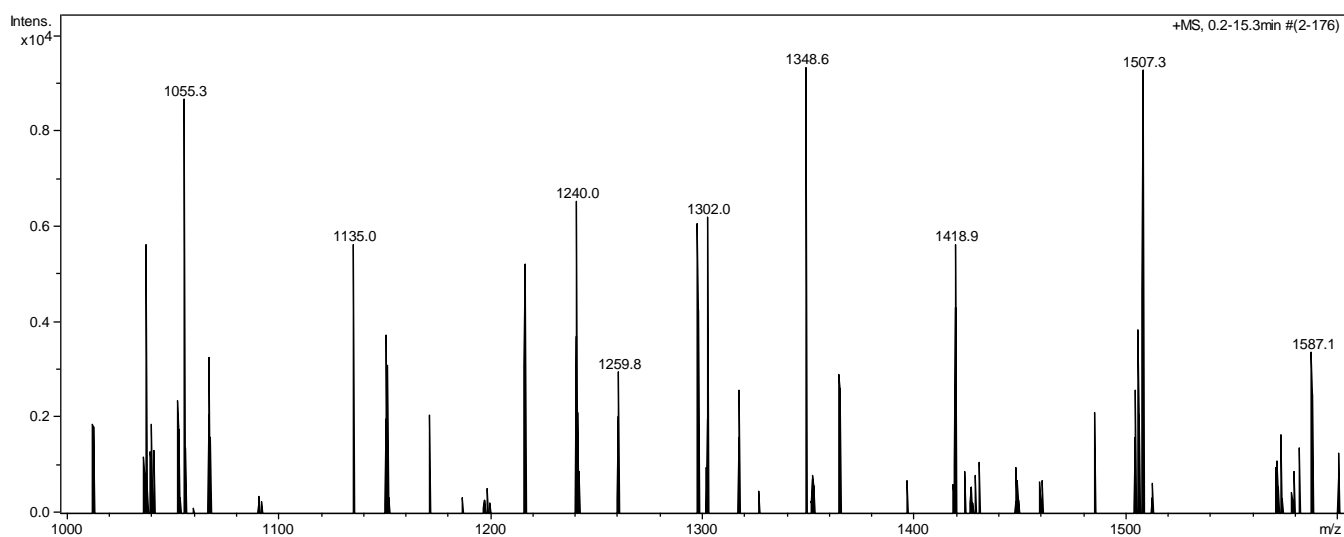


Figure S-4. PEGP<sup>+</sup> 200, MS-: 500-800 m/z

**Mass spectrum product PEGP<sup>+</sup> 1000 (M=1364)**



**Figure S-5. Mass spectrum PEGP<sup>+</sup> 1000, MS+: 50-1600 m/z**



**Figure S-6. Mass spectrum PEGP<sup>+</sup> 1000, MS+: 1000-1600 m/z**

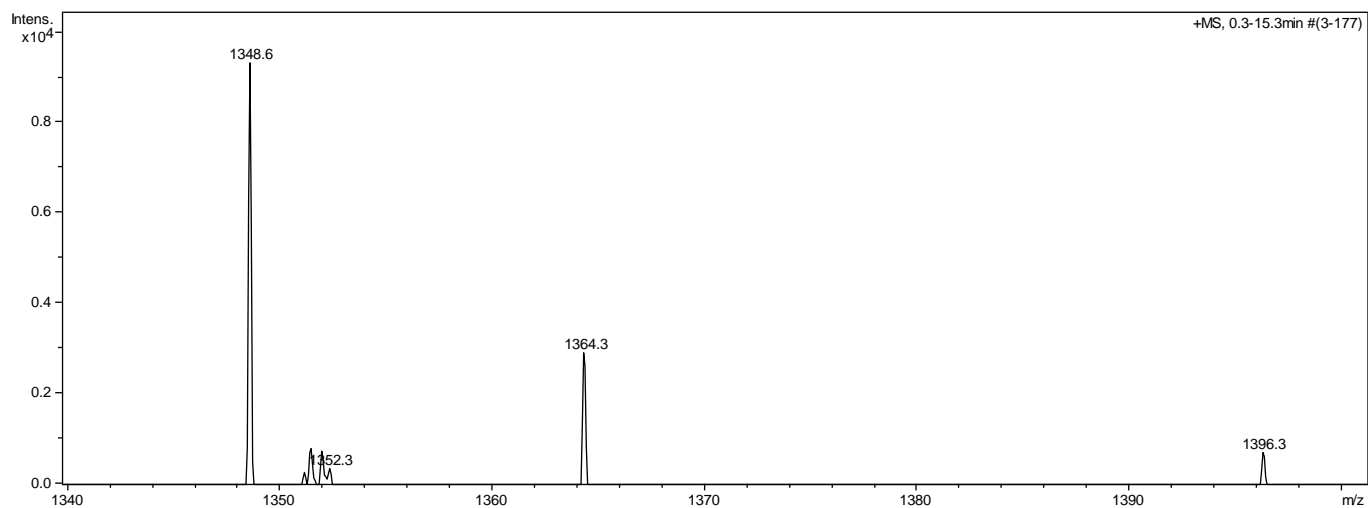


Figure S-7. Mass spectrum PEGP<sup>+</sup> 1000, MS<sup>+</sup>: 1340-1400 m/z

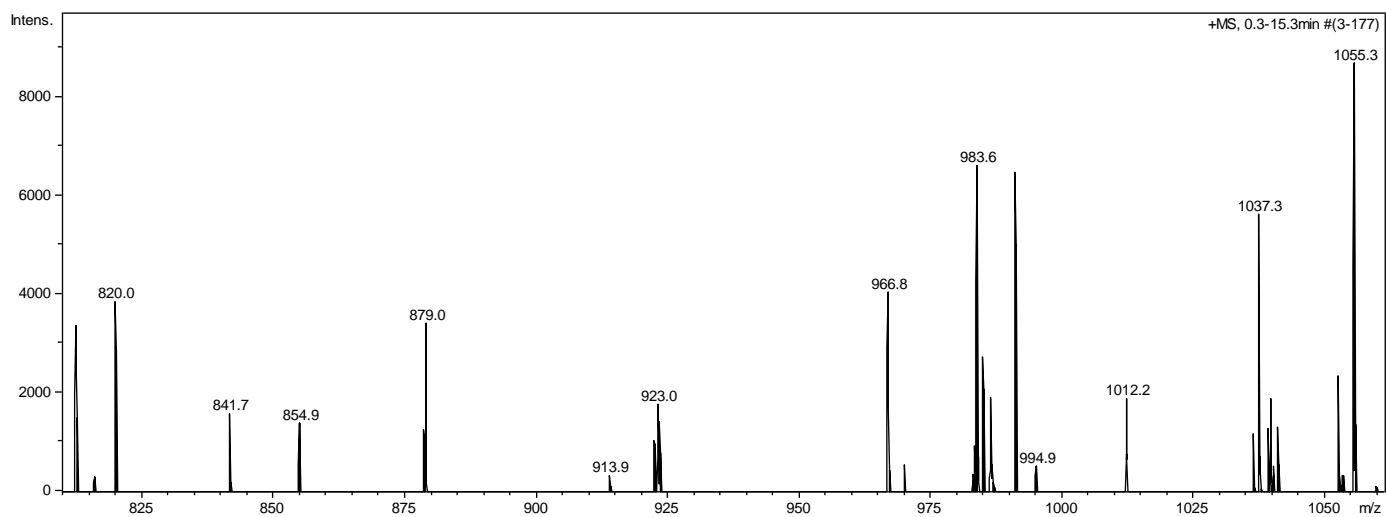
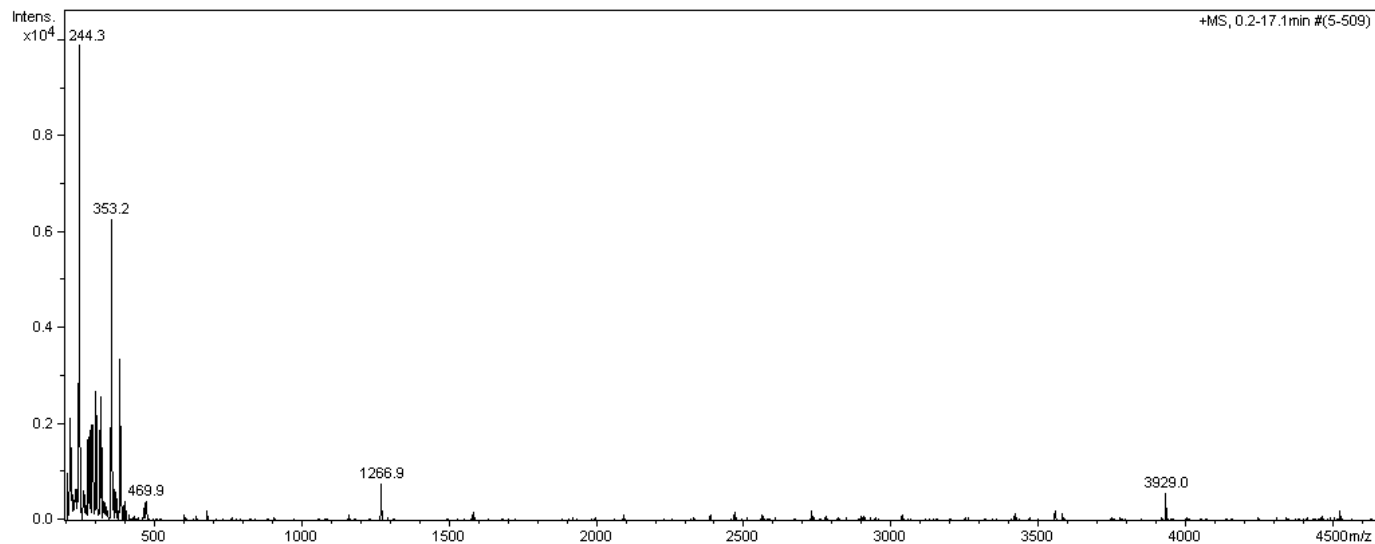
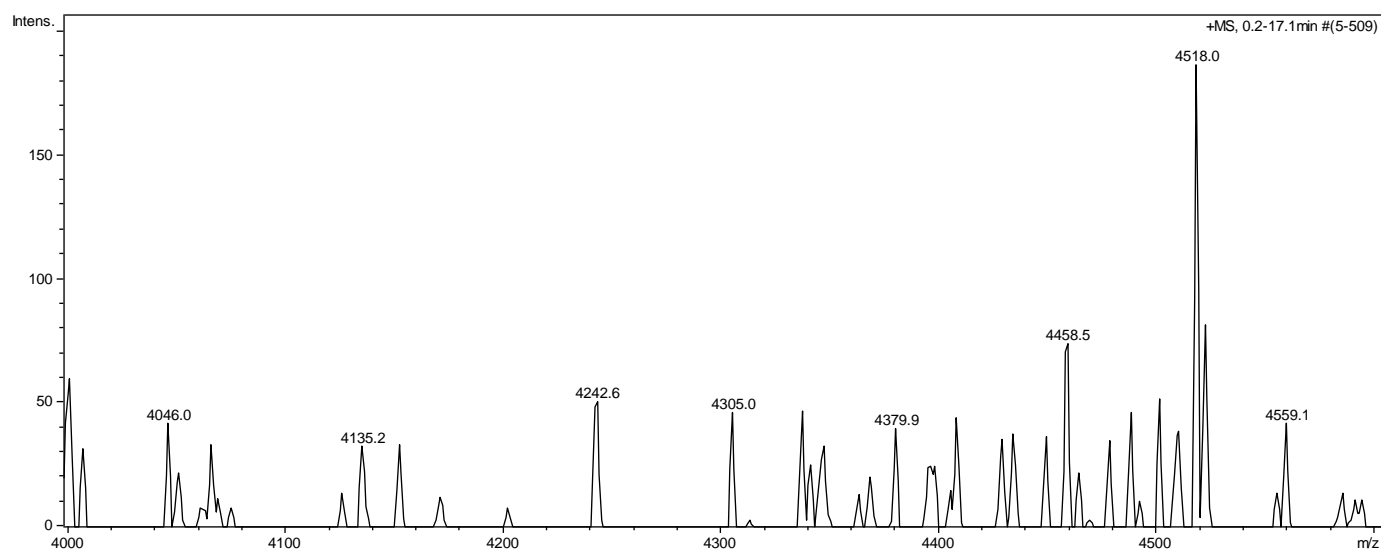


Fig. S-8. Mass spectrum PEGP<sup>+</sup> 1000, MS<sup>+</sup>: 810-1060 m/z

**Mass spectrum product PEGP<sup>+</sup> 4000**



**Figure S-9. PEGP<sup>+</sup> 4000, MS+: 200-4600 m/z**



**Figure S-10. PEGP<sup>+</sup> 4000, MS+: 4000-4600 m/z**

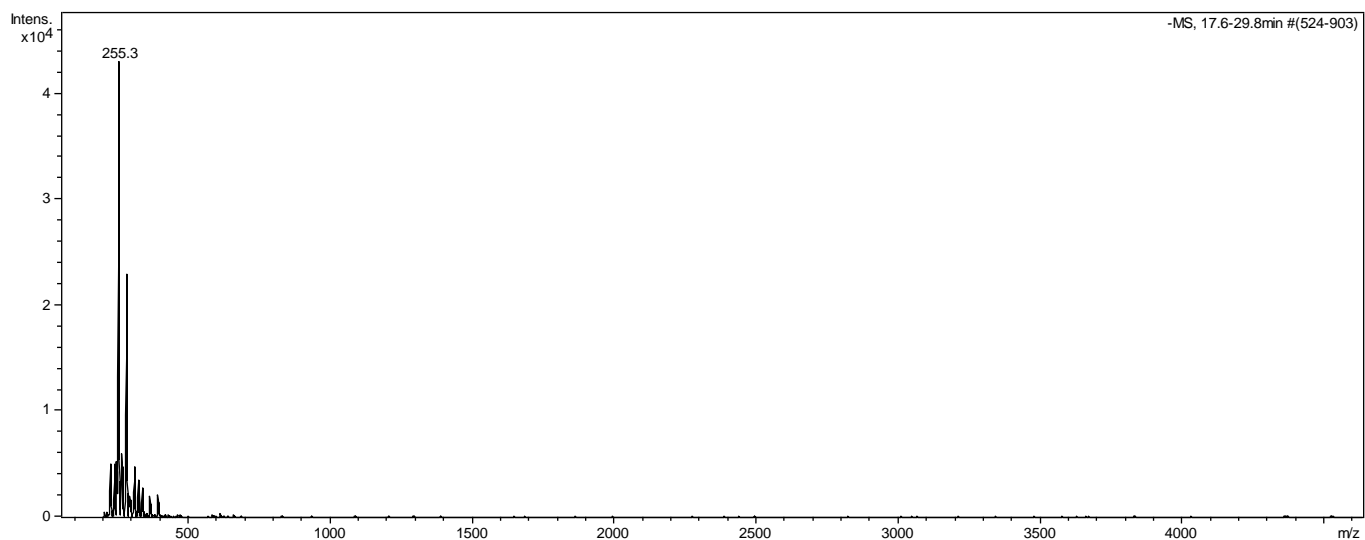


Figure S-11. PEGP<sup>+</sup> 4000, MS-: 200-4600 m/z

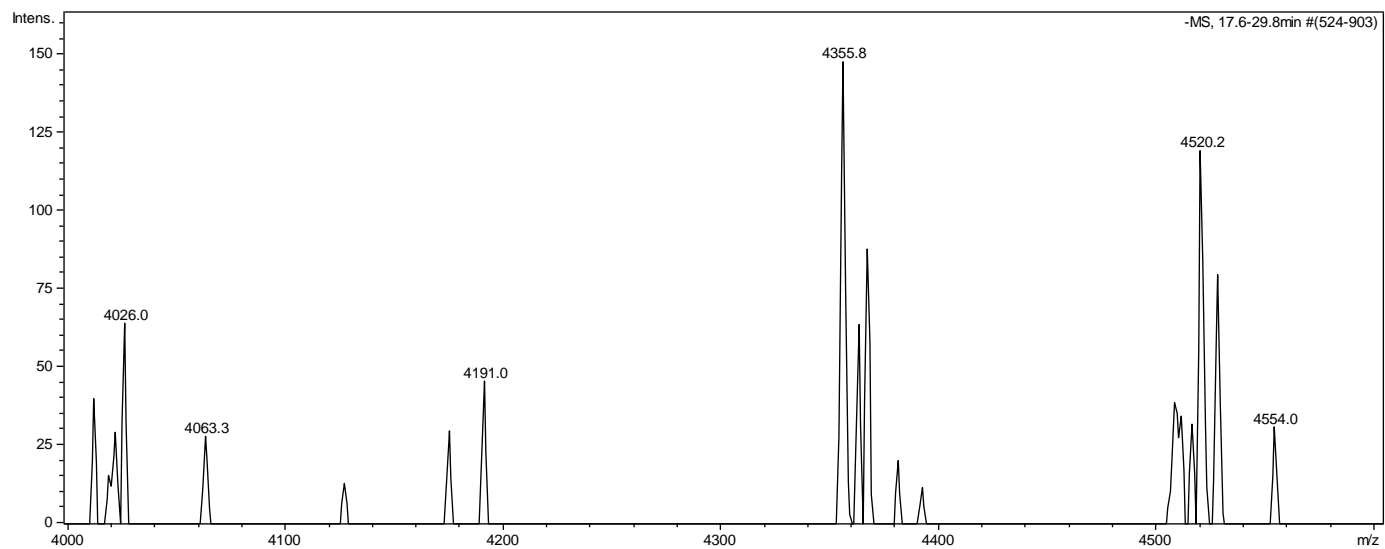


Figure S-12. PEGP<sup>+</sup> 4000, MS-: 4000-4600 m/z



## FT-IR Spectra

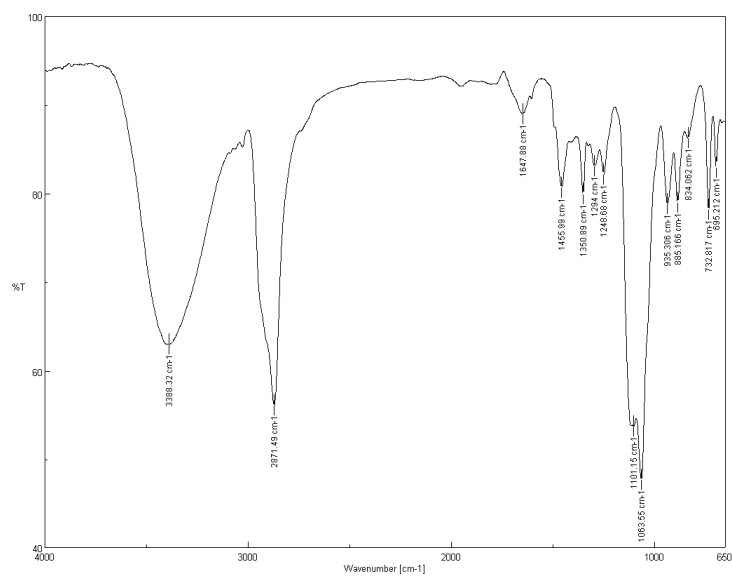


Figure S-13. FT-IR spectrum of PEGP<sup>+</sup>-200.

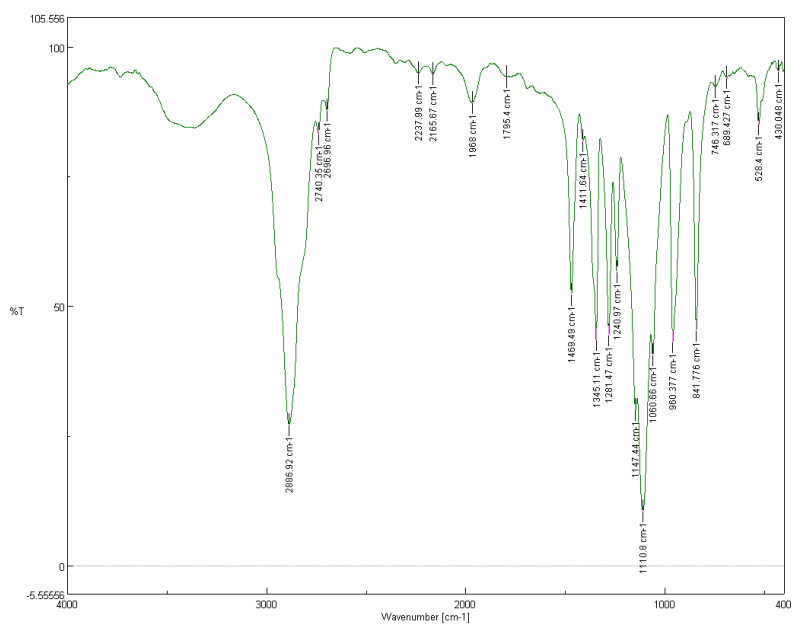
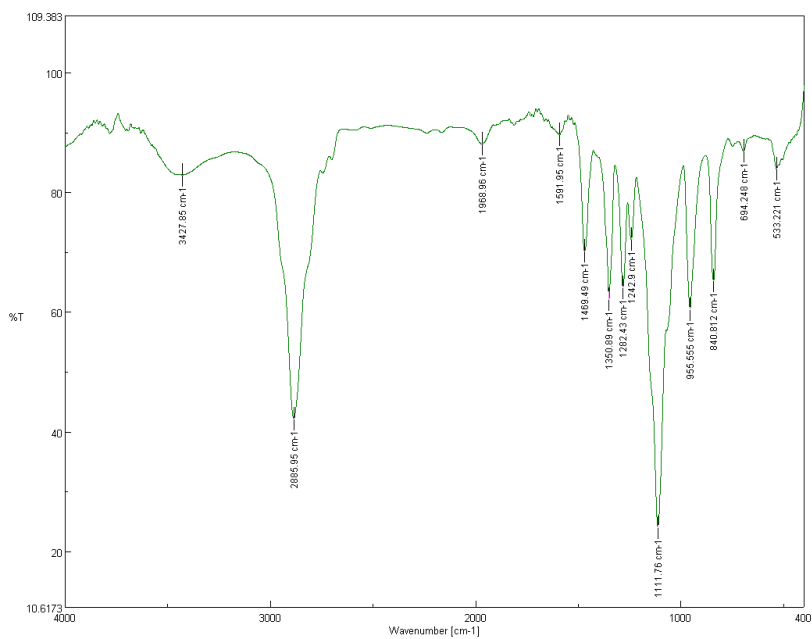
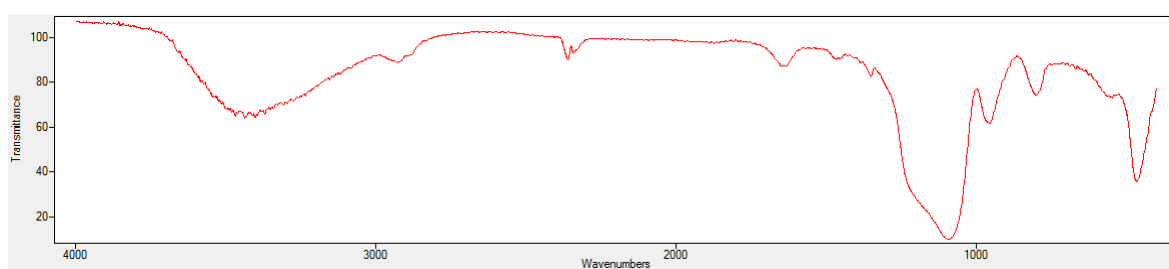


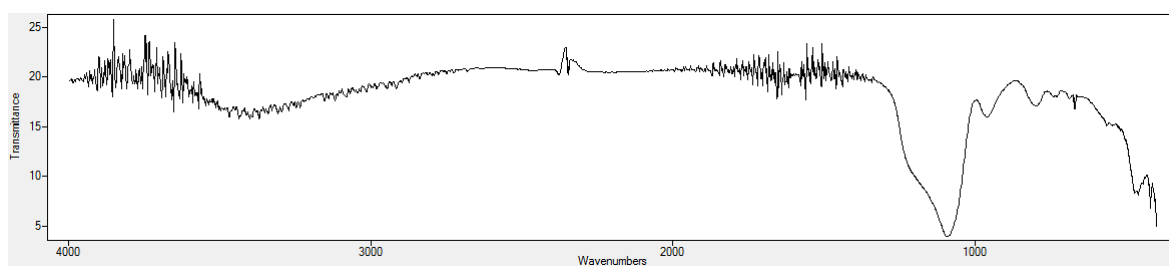
Figure S-14. FT-IR spectrum of PEGP<sup>+</sup>-1000.



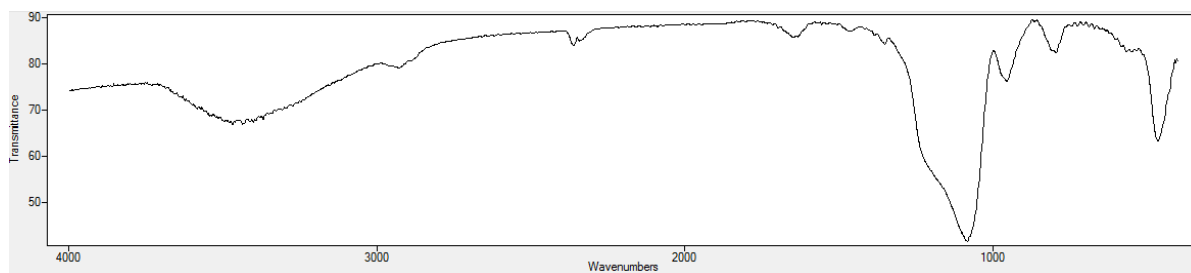
**Figure S-15.** FT-IR spectrum of PEGP<sup>+</sup>-4000.



**Figure S-16.** FT-IR spectrum of silica precipitated from "control" experiments.

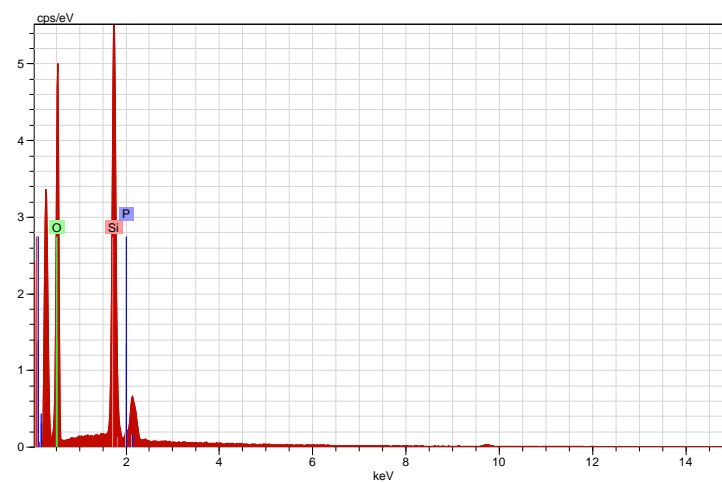


**Figure S-17.** FT-IR spectrum of silica precipitated from silicic acid condensation experiments in the presence of 150 ppm PEGP<sup>+</sup>-1000.



**Figure S-18.** FT-IR spectrum of silica precipitated from silicic acid condensation experiments in the presence of 150 ppm PEGP<sup>+</sup>-4000.

### EDS Spectra



Spectrum: Acquisition

El	AN	Series	unn. C	norm. C	Atom. C	Error
			[wt.-%]	[wt.-%]	[at.-%]	[%]

Si	14	K-series	16.46	16.46	10.26	0.7
P	15	K-series	3.23	3.23	1.83	0.2
O	8	K-series	80.31	80.31	87.91	1.7

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Total: 100.00 100.00 100.00

**Figure S-19.** EDS spectrum of silica precipitates in the presence of 150 ppm of PEGP<sup>+</sup>-1000.

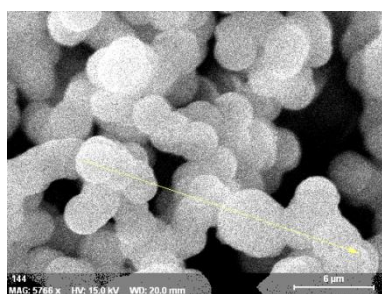
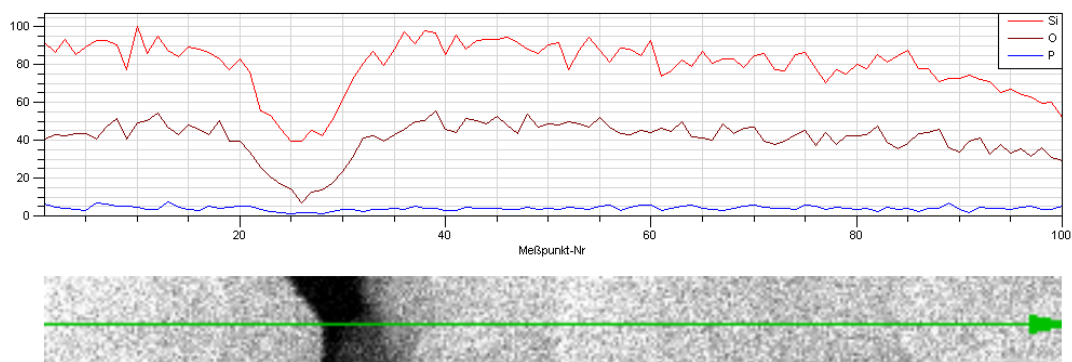


Image size: 512 x 384

Mag: 5766 x

HV: 15.0 kV



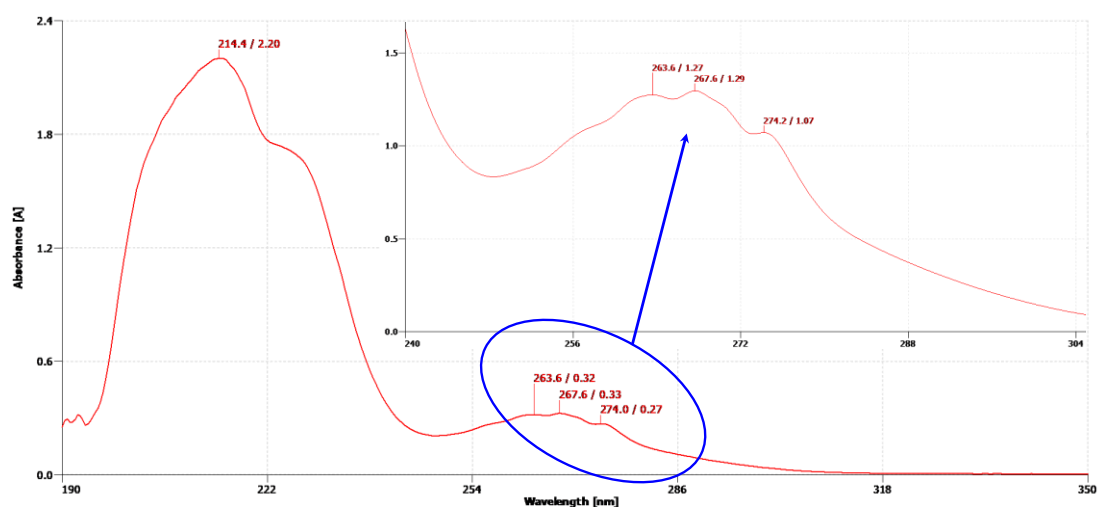
Line scan

Measure time: 1:40 min

Start: (103,201) End: (477,326)

Length: 22  $\mu\text{m}$

**Figure S-20.** Line spectrum of silica precipitates in the presence of 150 ppm of PEGP<sup>+</sup>-1000.



**Figure S-21.** UV-vis spectrum of product PEGP<sup>+</sup>-200.

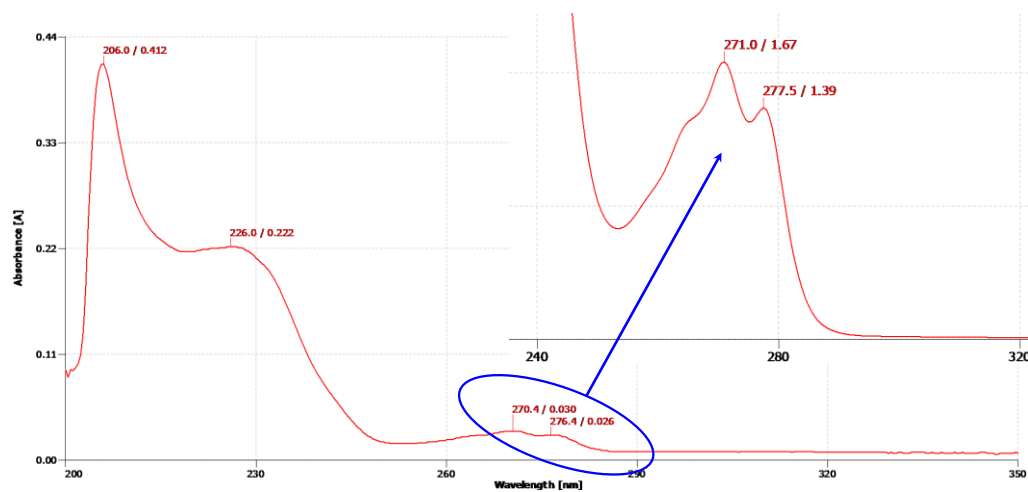


Figure S-22. UV-vis spectrum of product PEGP<sup>+</sup>-1000.

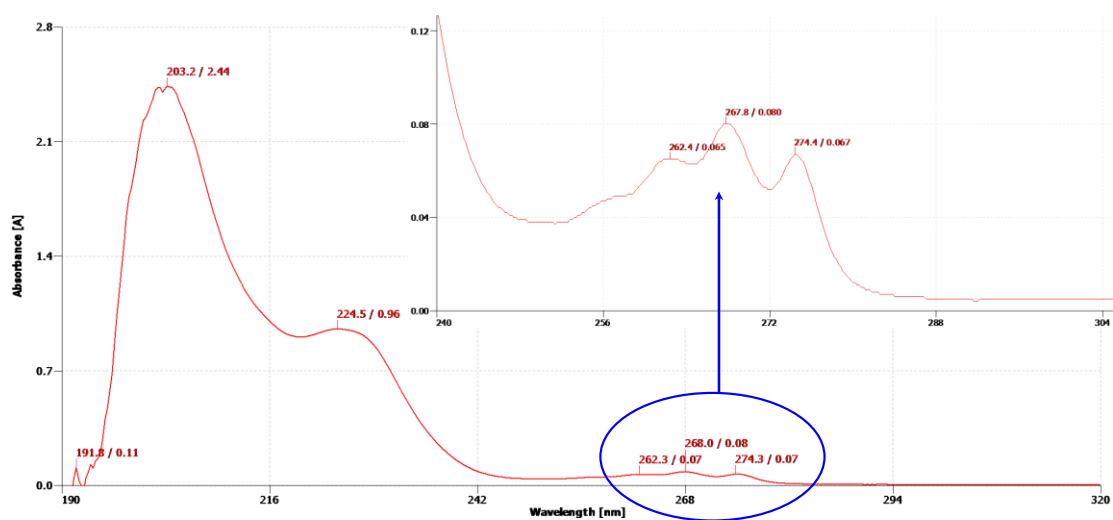


Figure S-23. UV-vis spectrum of product PEGP<sup>+</sup>-4000.

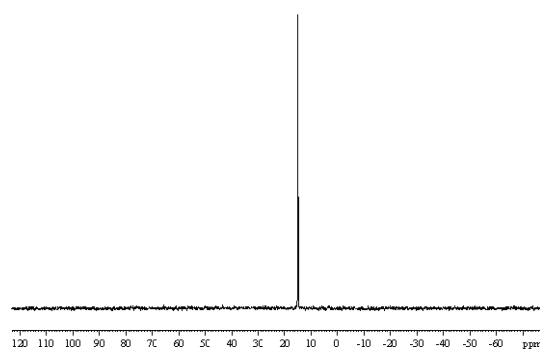
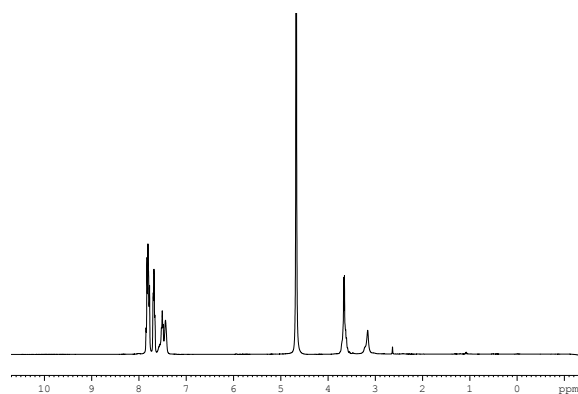


Figure S-24. <sup>31</sup>P NMR spectra of PEGP<sup>+</sup>-1000 (162MHz, CDCl<sub>3</sub>, δ: 14,593 ppm, s).



**Figure S-25.**  $^1\text{H}$  NMR spectra of  $\text{PEGP}^+-1000$  (400MHz,  $\text{CDCl}_3$ .  $\delta$ : 3.60 (s,  $-\text{CH}_2-$ ), 4, 67(-  
 $\text{CH}=\text{CH}_2$ ), 8,00-7,20 (m,  $-\text{C}_6\text{H}_5$ )).