

Sulfhydrylated graphene-encapsulated iron nanoparticles directly aminated with polyethylenimine: a novel magnetic nanoplatform for bioconjugation of gamma globulins and polyclonal antibodies

Electronic Supplementary Information (ESI)

Artur Kasprzak,^{a*} Magdalena Poplawska,^{a*} Michal Bystrzejewski^b
and Ireneusz P. Grudzinski^c

^a Faculty of Chemistry, Warsaw University of Technology, 00-664 Warsaw, Poland

^b Department of Chemistry, University of Warsaw, 02-093 Warsaw, Poland

^c Faculty of Pharmacy, Medical University of Warsaw, 02-097 Warsaw, Poland

1. Structural modification of pristine PEI 25kDa – NMR spectra

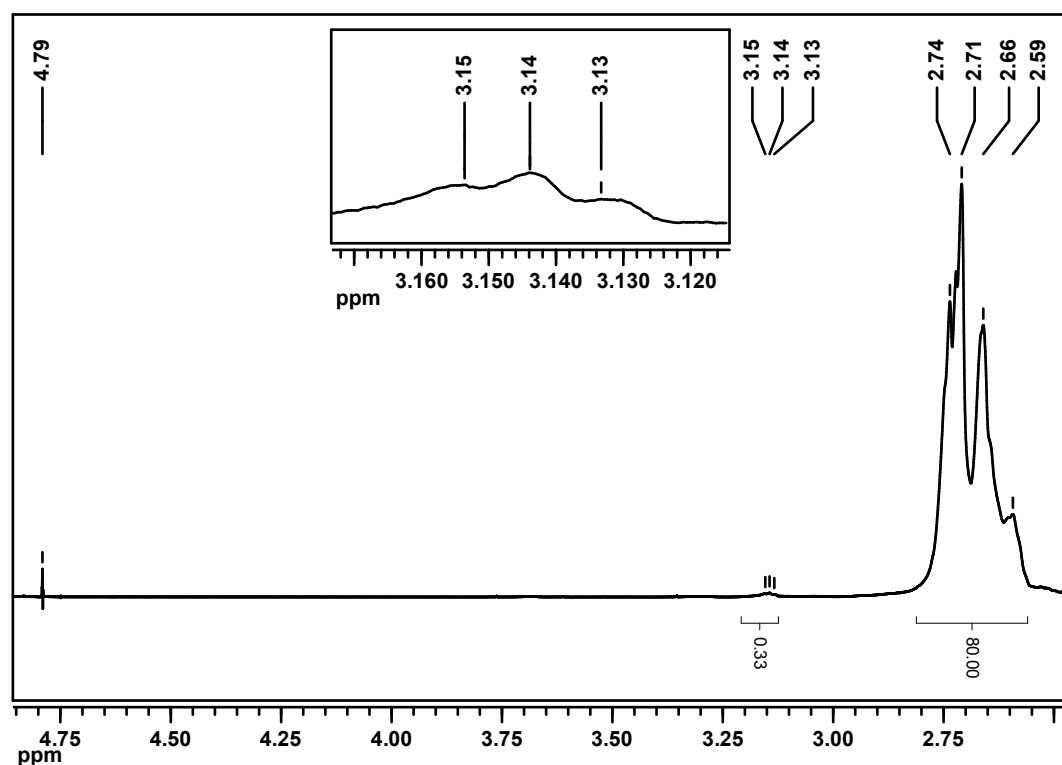


Fig. S1. ¹H NMR of pristine PEI 25kDa

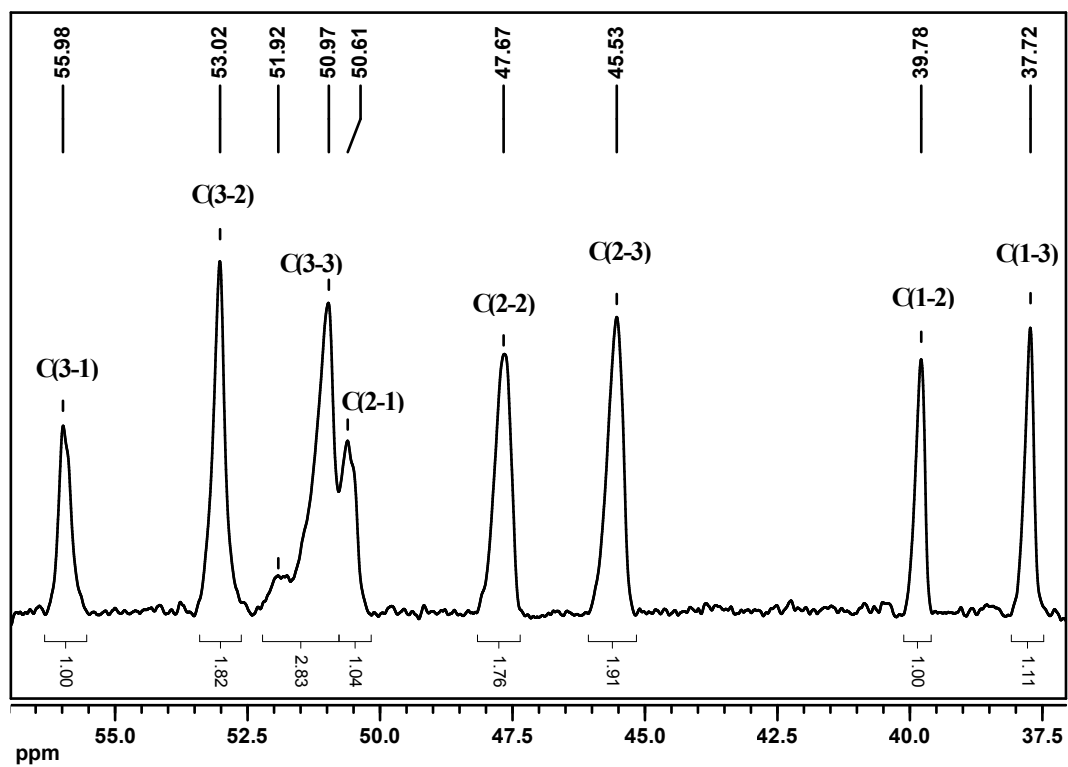


Fig. S2. ^{13}C NMR of pristine PEI 25kDa

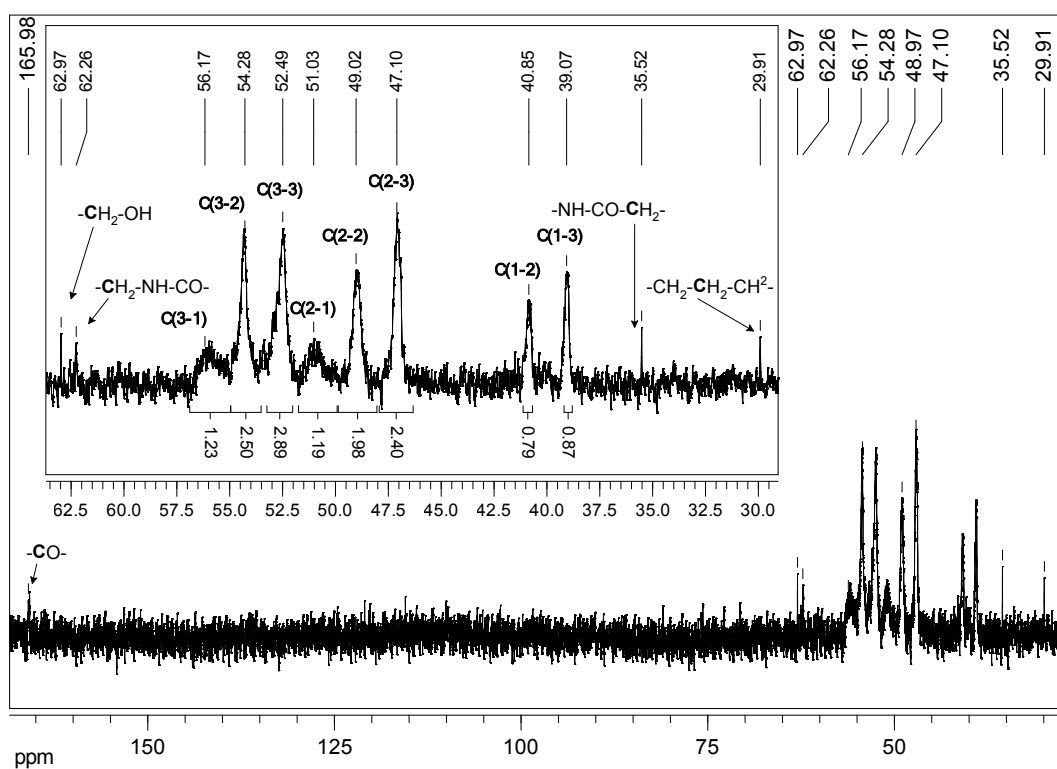


Fig. S3. ^{13}C NMR inverse-gated of PEI25k-GBL (5 days reaction)

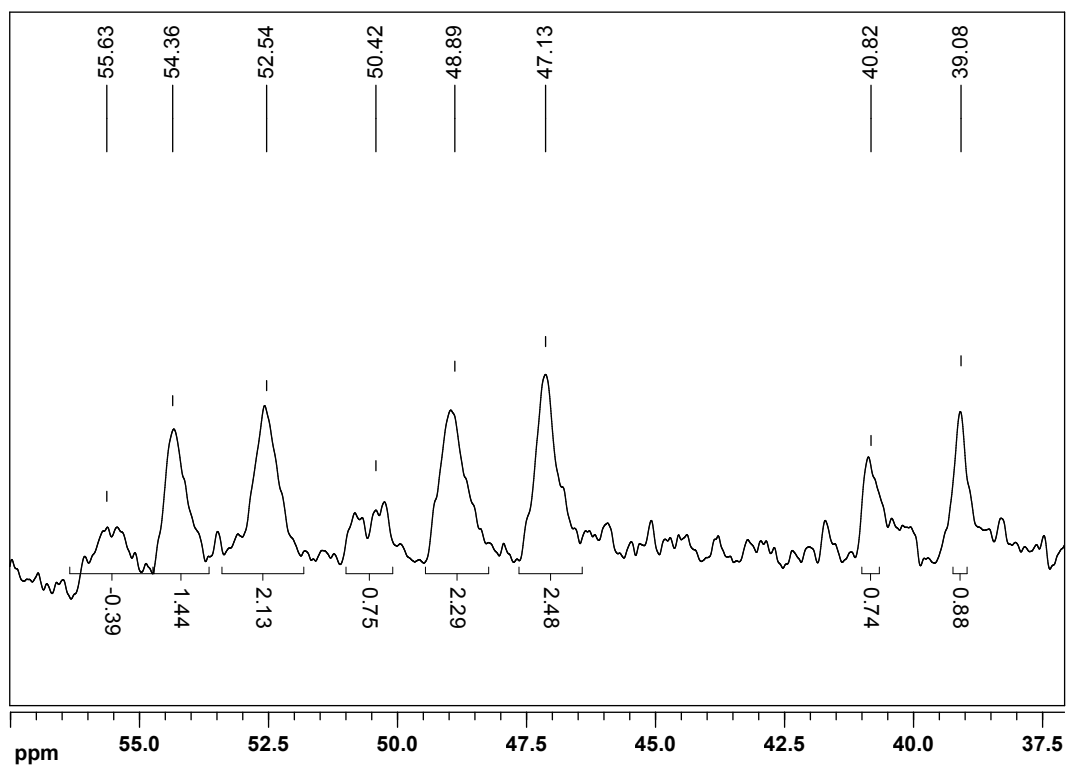


Fig. S4. ^{13}C NMR inverse-gated of PEI25k-GBL (24 h) – zoom 55.63-39.08

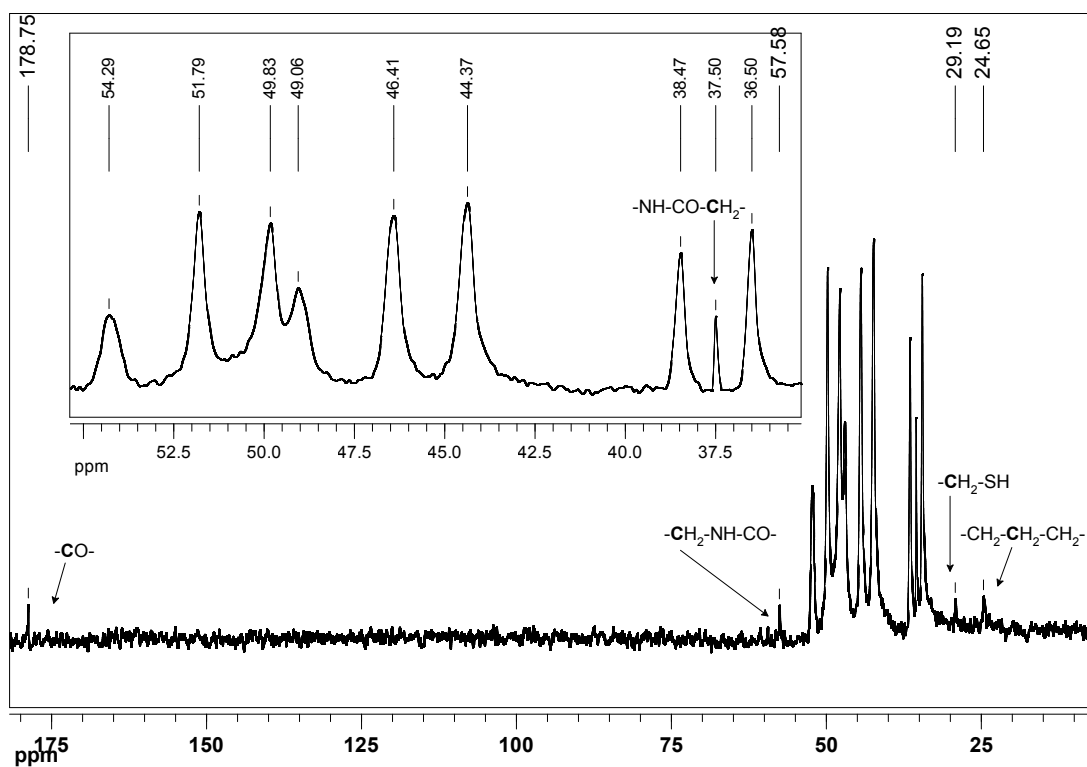


Fig. S5. ^{13}C NMR inverse-gated of PEI25k-GBL-SH

2. FT-IR spectra of Fe@C-NH-PEI25k conjugates and its derivatives

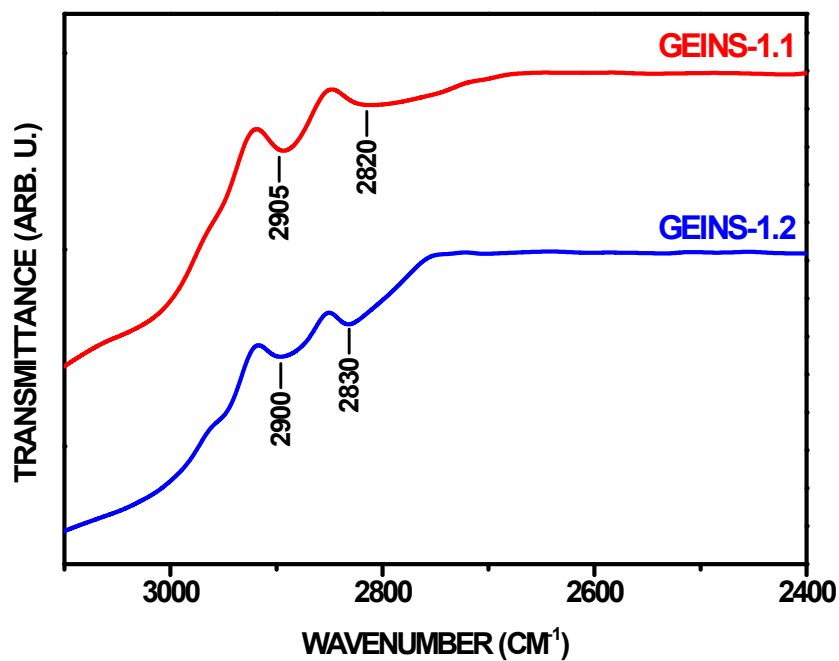


Fig. S6. FT-IR spectra of GEINS-1.1 and GEINS-1.2; 2400 – 3100 cm^{-1} zoom

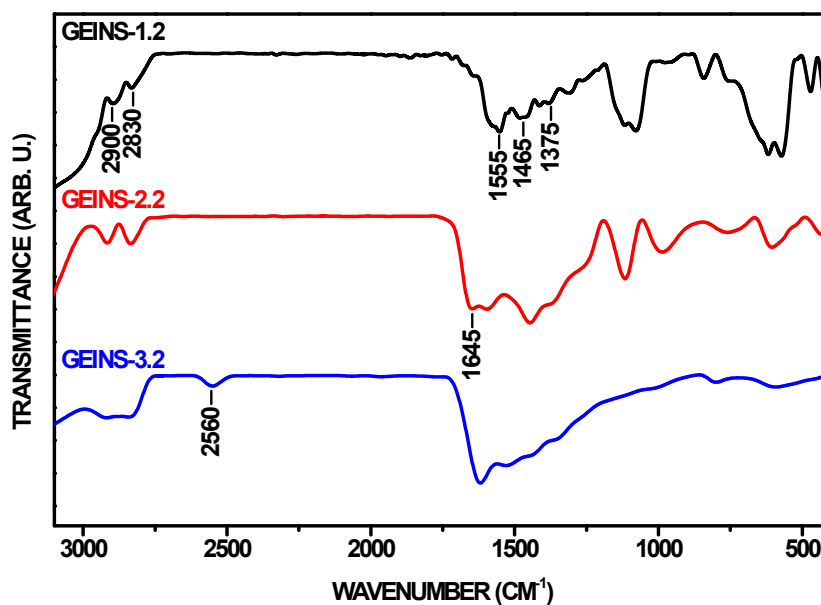


Fig. S7. FT-IR spectra of GEINS-1.2

3. A titration study

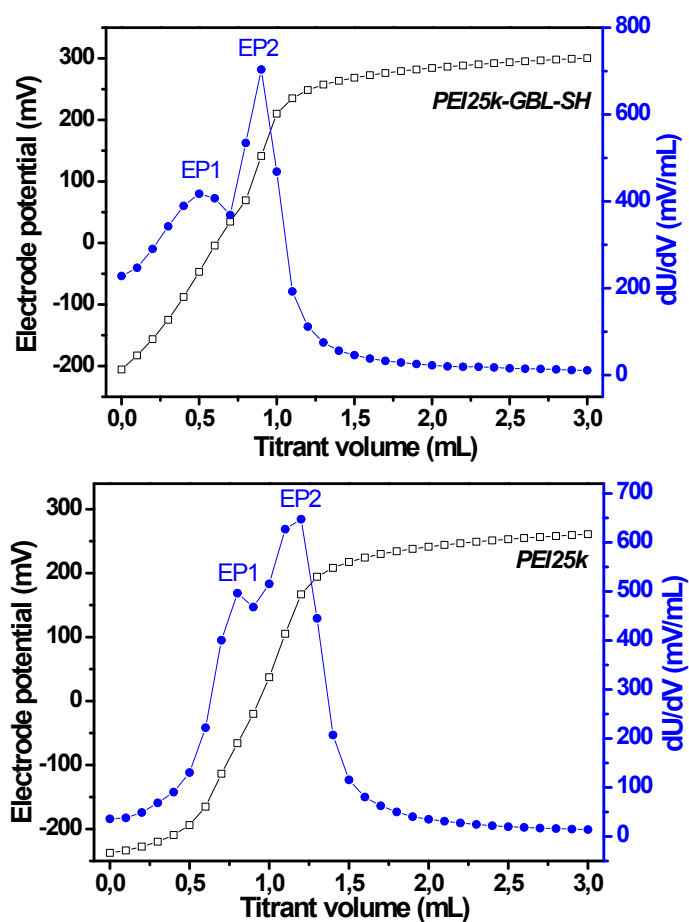


Fig. S8. Titration curves of PEI 25kDa (top) and PEI25k-GBL-SH (bottom) solutions (1.1 mg/mL in 0.1 M NaCl, sample volume 10 mL, initial pH=10).

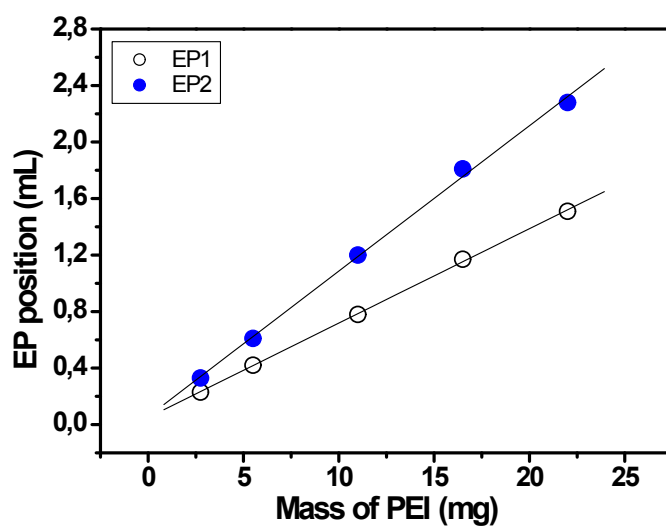


Fig. S9. Relation between EP position and mass of PEI 25kDa used in titration.

Table S1. Titration endpoint positions

Mass of PEI (mg)	EP1 (mL) (2° amines)	EP2 (mL)	EP2-EP1 (mL) (1° amines)	(2° amines)/ (1° amines)
5.50	0.42	0.61	0.19	2.21
11.00	0.78	1.20	0.42	1.86
22.00	1.51	2.28	0.77	1.96
2.75	0.25	0.33	0.08	3.13
16.50	1.17	1.81	0.64	1.83
				Mean: 2.20±0.48

Comment [A]: Referee 2

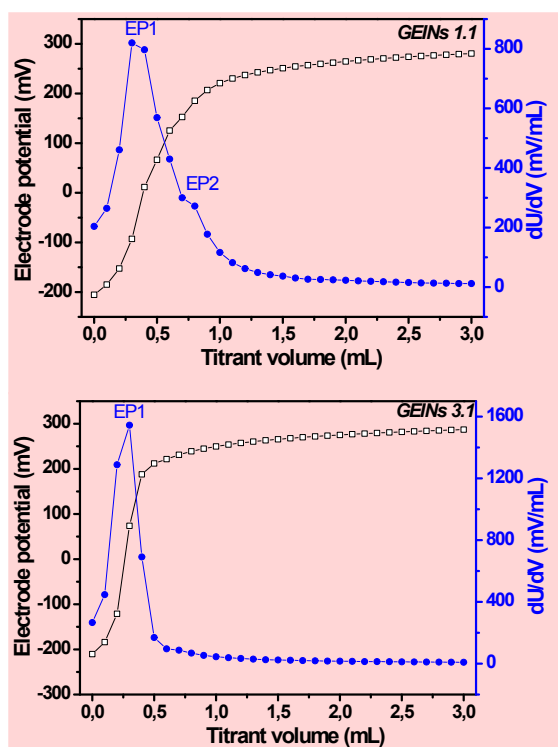


Fig. S10. Titration curves of GEINS-1.1 (59.3 mg) and GEINS-3.1 (48.8 mg)

4. Bioconjugation of gamma-globulins and human polyclonal antibody (IgG-FITC) to sulfhydrylated CEINs-PEI nanoplatforms

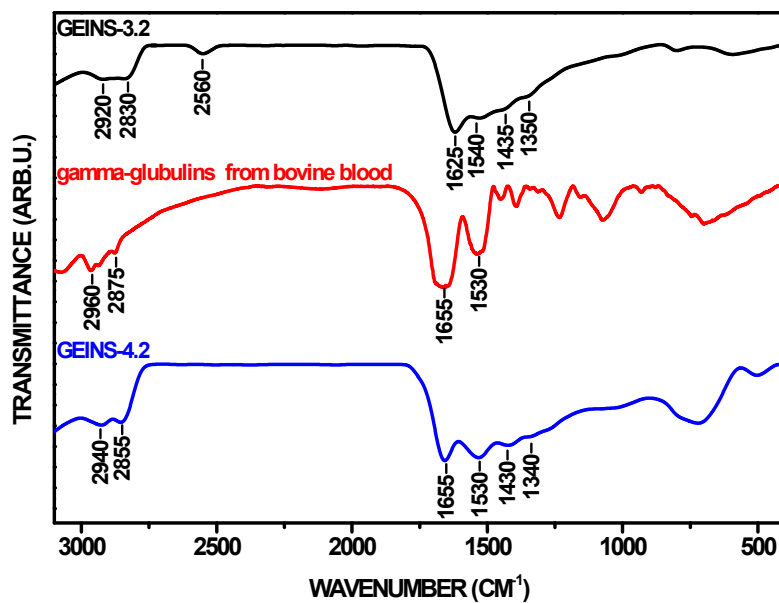


Fig. S11. FT-IR spectra of GEINS-4.2

5. Biocompounds adsorption

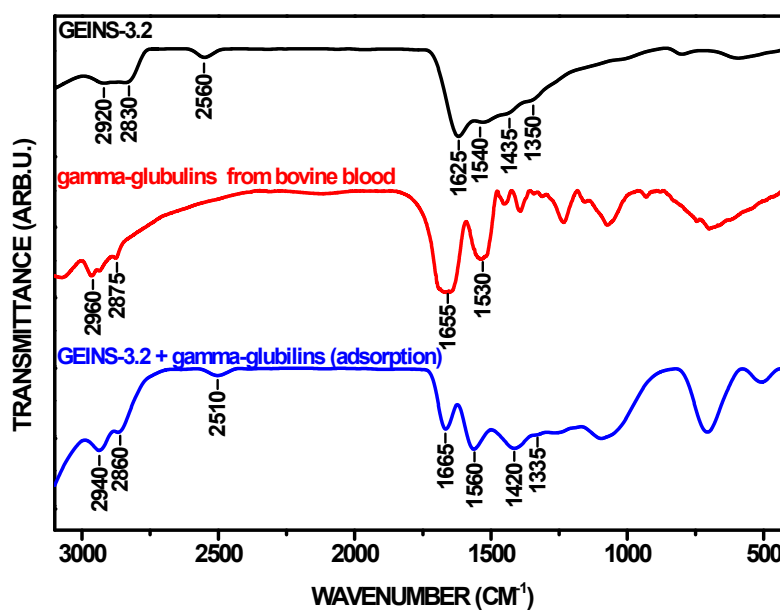


Fig. S12. FT-IR spectra of the physical mixture of GEINS-3.2 and gamma-globulins

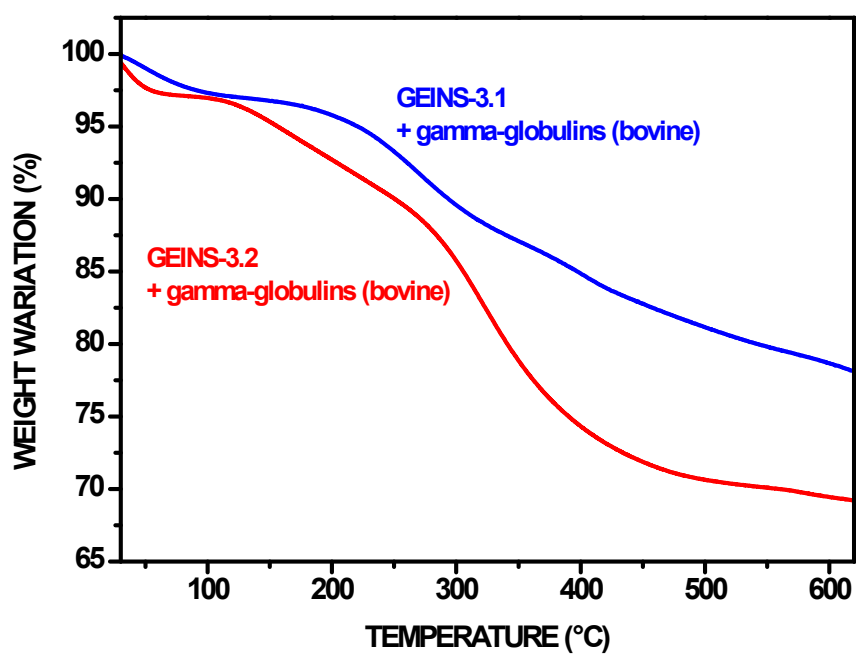


Fig. S13. TGA curves (in nitrogen) of GEINS-3.1 and GEINS-3.2 with the adsorbed gamma-globulins

6. Confocal microscopy

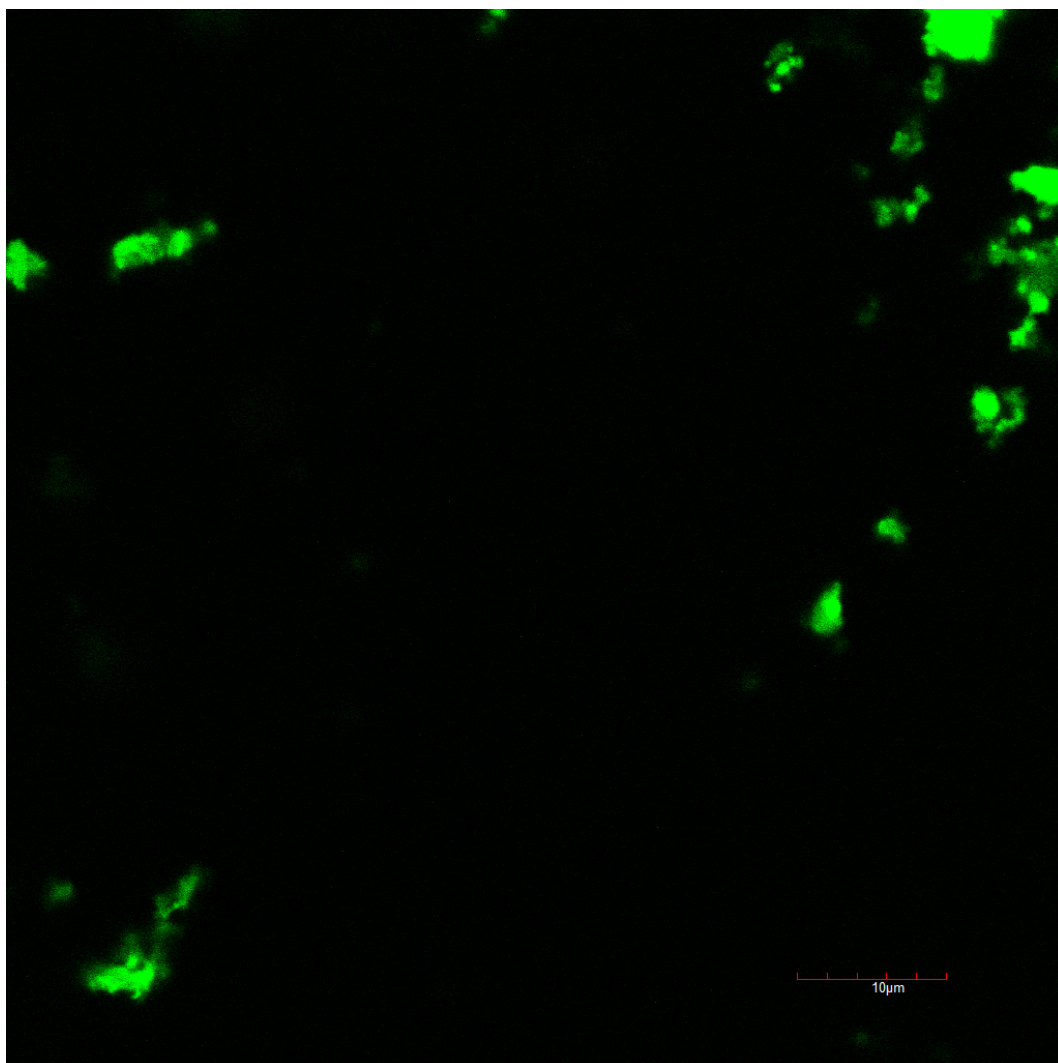


Fig. S14. Confocal microscopy image of GEINS-3.2 with the adsorbed IgG-FITC