

Supplementary Material

Table S 1. Water content and swelling of composite bead in PBS in Figure 5a

Composite bead	Water content, g/g	Swelling %SD2, %	Swelling %SD4, %
Blank	0.910 ± 0.025	111 ± 0.59	92 ± 0.63
Pec-0.1GO	0.915 ± 0.018	105 ± 0.22	42 ± 0.38
Pec-0.05GluGO	0.956 ± 0.013	142 ± 0.26	116 ± 0.33
Pec-0.1GluGO	0.960 ± 0.010	227 ± 0.21	-
Pec-0.2GluGO	0.960 ± 0.016	223 ± 0.47	-

Table S 2. Stability of pectin-based composite beads in distilled water and acid acetic 1% in Figure 5b

Composite bead	Percentage of remaining composite beads in distilled water, %	Percentage of remaining composite beads in acid acetic 1%, %
Blank	100 ± 1.11	83.33 ± 0.56
Pec-0.1GO	100 ± 0.83	92.22 ± 1.11
Pec-0.05GluGO	100 ± 0.67	92.22 ± 0.56
Pec-0.1GluGO	100 ± 0.56	93.33 ± 0.56
Pec-0.2GluGO	100 ± 0.56	93.33 ± 0.86

Table S 3. Stability of pectin-based composite beads in OECD in Figure 11b

Composite bead	Percentage of remaining composite beads in distilled OECD, %						
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Blank	0	0	0	0	0	0	0
Pec-0.1GO	20 ± 0.67	0	0	0	0	0	0
Pec-0.05GluGO	30 ± 0.86	10 ± 0.56	0	0	0	0	0
Pec-0.1GluGO	70 ± 0.83	50 ± 0.56	50 ± 0.83	0	0	0	0
Pec-0.2GluGO	100 ± 0.83	50 ± 1.11	50 ± 0.86	0	0	0	0

Table S 4. Stability of pectin-based composite beads in oxytetracycline in Figure 11c

Composite bead	Percentage of remaining composite beads in distilled oxytetracycline, %						
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Blank	25 ± 1.33	25 ± 1.11	0	0	0	0	0
Pec-0.1GO	90 ± 0.83	90 ± 0.83	90 ± 0.83	90 ± 0.67	90 ± 0.86	90 ± 0.56	90 ± 0.56
Pec-0.05GluGO	95 ± 0.56	95 ± 0.56	95 ± 0.56	95 ± 0.86	95 ± 1.33	95 ± 1.33	95 ± 1.33
Pec-0.1GluGO	100 ± 0.56	100 ± 0.56	100 ± 0.86	100 ± 0.86	100 ± 0.86	100 ± 0.86	95 ± 1.11
Pec-0.2GluGO	100 ± 0.86	100 ± 0.86	100 ± 0.56	100 ± 1.33	100 ± 0.83	100 ± 0.86	90 ± 1.33

Table S 5. Stability of pectin-based composite beads in Zn²⁺ in Figure 11d

Composite bead	Percentage of remaining composite beads in distilled Zn ²⁺ , %						
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Blank	80 ± 0.83	80 ± 0.83	80 ± 0.83	80 ± 0.83	80 ± 1.33	70 ± 0.67	0
Pec-0.1GO	100 ± 0.56	100 ± 0.67	100 ± 0.67	90 ± 0.83	50 ± 0.83	0	0
Pec-0.05GluGO	100 ± 0.67	100 ± 0.67	100 ± 0.67	100 ± 0.83	90 ± 0.86	90 ± 0.86	90 ± 0.86
Pec-0.1GluGO	100 ± 0.56	100 ± 0.67	100 ± 0.56	100 ± 1.11	100 ± 1.33	90 ± 0.56	90 ± 0.56
Pec-0.2GluGO	100 ± 0.86	100 ± 0.86	100 ± 1.11	100 ± 1.11	100 ± 1.33	90 ± 1.13	90 ± 1.13

Table S 6. Stability of pectin-based composite beads in Ni²⁺ in Figure 11e

Composite bead	Percentage of remaining composite beads in distilled Ni ²⁺ , %						
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Blank	70 ± 1.33	0	0	0	0	0	0
Pec-0.1GO	100 ± 0.67	30 ± 0.56	0	0	0	0	0
Pec-0.05GluGO	100 ± 0.86	30 ± 0.56	0	0	0	0	0
Pec-0.1GluGO	90 ± 0.56	30 ± 0.56	0	0	0	0	0
Pec-0.2GluGO	100 ± 1.33	100 ± 1.33	100 ± 1.11	100 ± 1.11	100 ± 1.11	100 ± 1.33	100 ± 1.33

Table S 7. Stability of pectin-based composite beads in Cr⁶⁺ in Figure 11f

Composite bead	Percentage of remaining composite beads in distilled Cr ⁶⁺ , %						
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Blank	60 ± 1.11	60 ± 1.33	40 ± 0.83	0	0	0	0
Pec-0.1GO	90 ± 0.83	50 ± 1.33	0	0	0	0	0
Pec-0.05GluGO	100 ± 0.83	100 ± 0.83	100 ± 1.11	100 ± 1.11	100 ± 1.11	100 ± 1.33	90 ± 1.33
Pec-0.1GluGO	100 ± 0.56	100 ± 0.56	100 ± 1.33	100 ± 0.83	100 ± 0.83	100 ± 1.33	100 ± 0.56
Pec-0.2GluGO	100 ± 1.11	100 ± 0.65	100 ± 0.87	100 ± 0.67	100 ± 0.56	100 ± 0.56	100 ± 0.83