SUPPLEMENTARY INFORMATION

Valorization of *Opuntia dillenii* biomass into a reusable bio-based composite for sustainable and efficient methyl orange adsorption

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FIGURE CAPTIONS

TABLE CAPTIONS

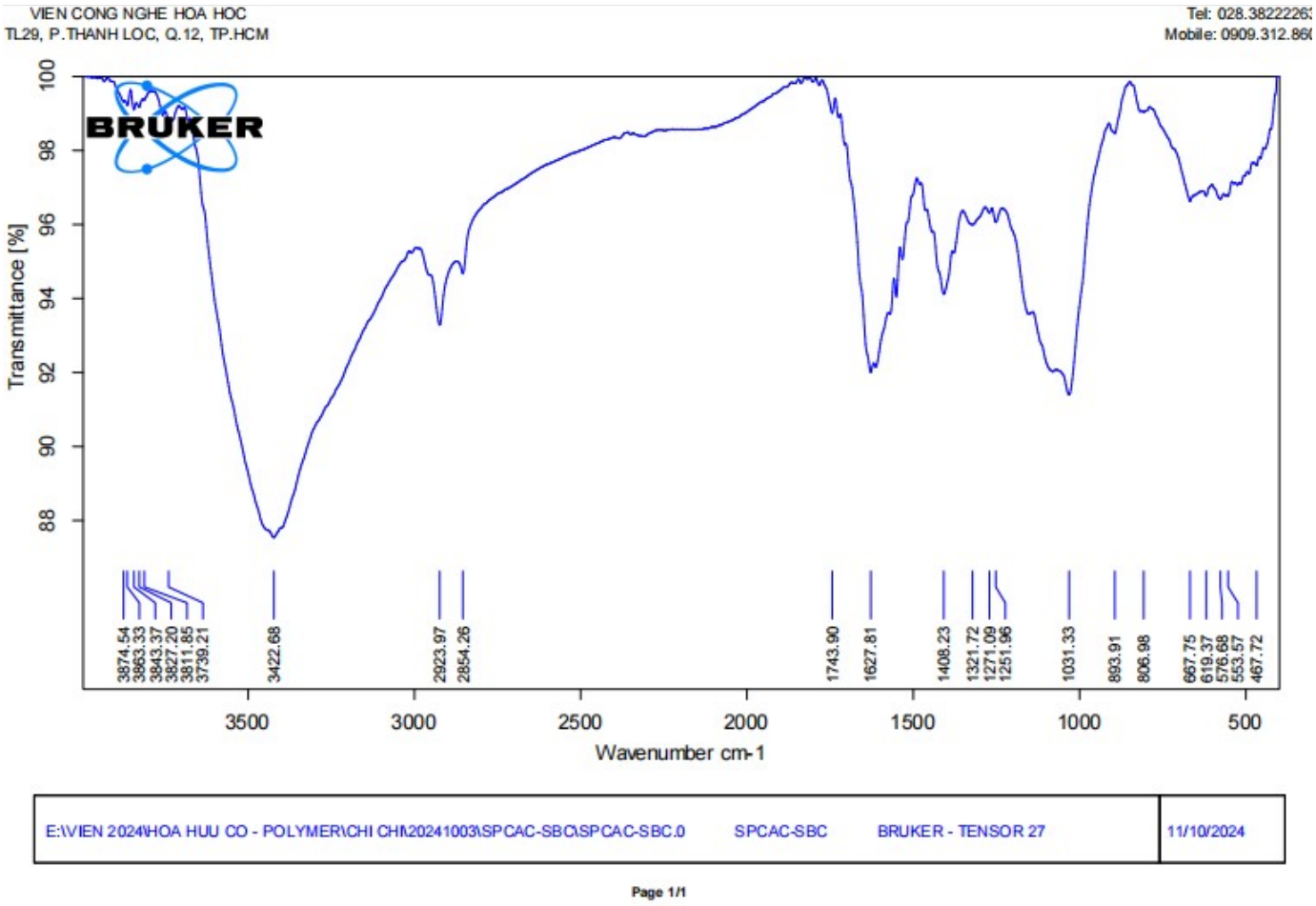

Figure S1. FTIR spectrum of SPCA

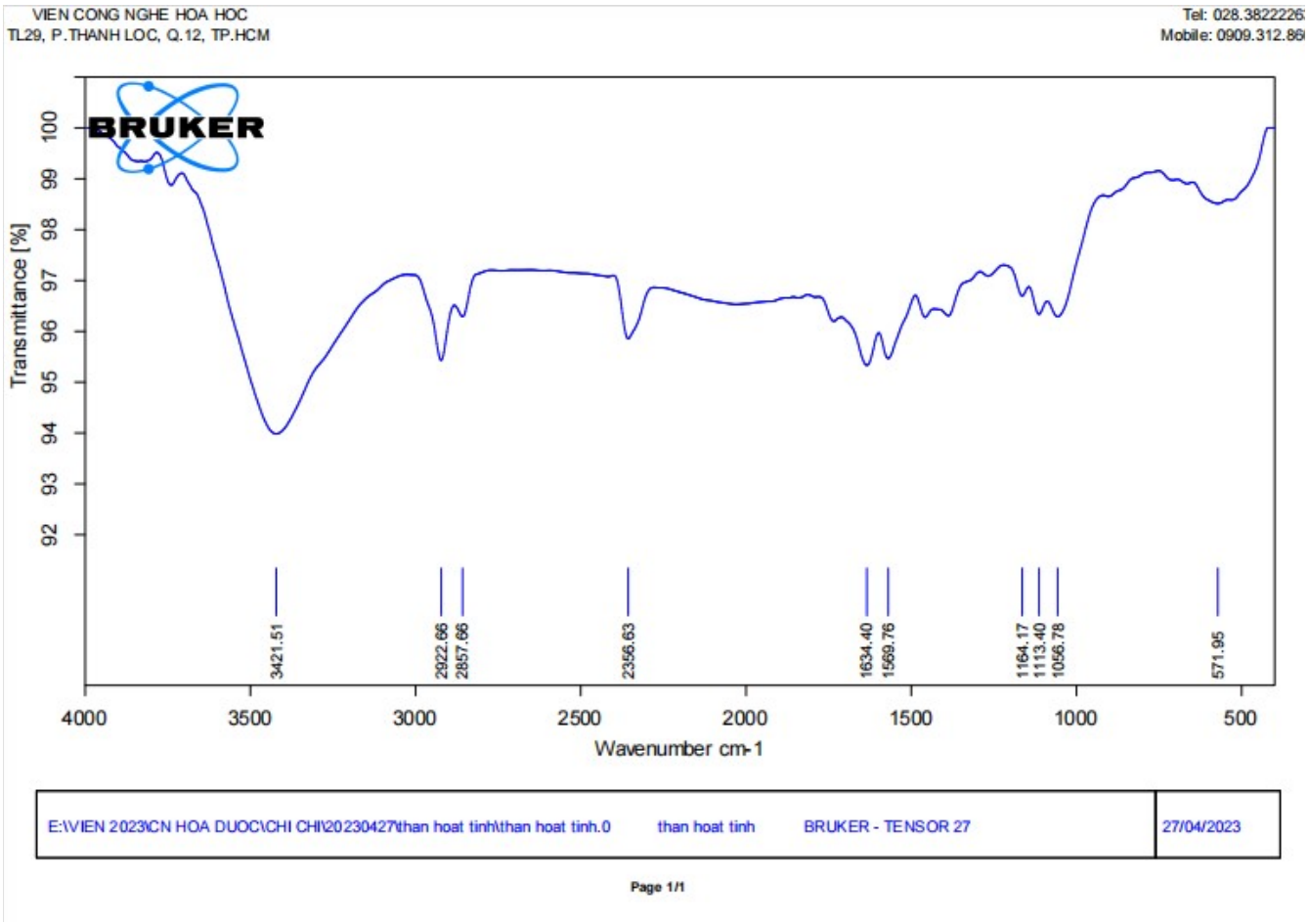

Figure S2. FTIR spectrum of activated carbon

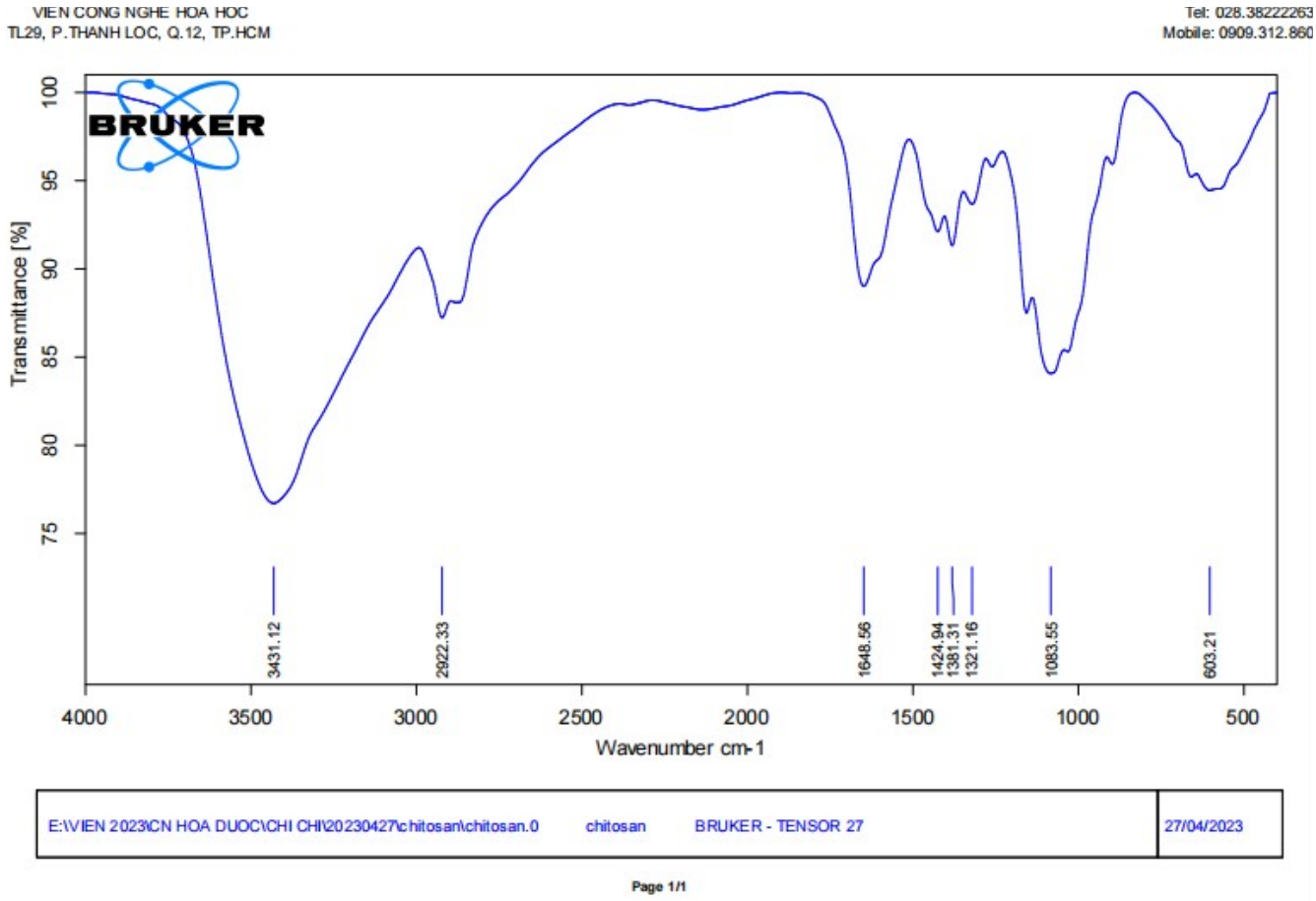

Figure S3. FTIR spectrum of chitosan

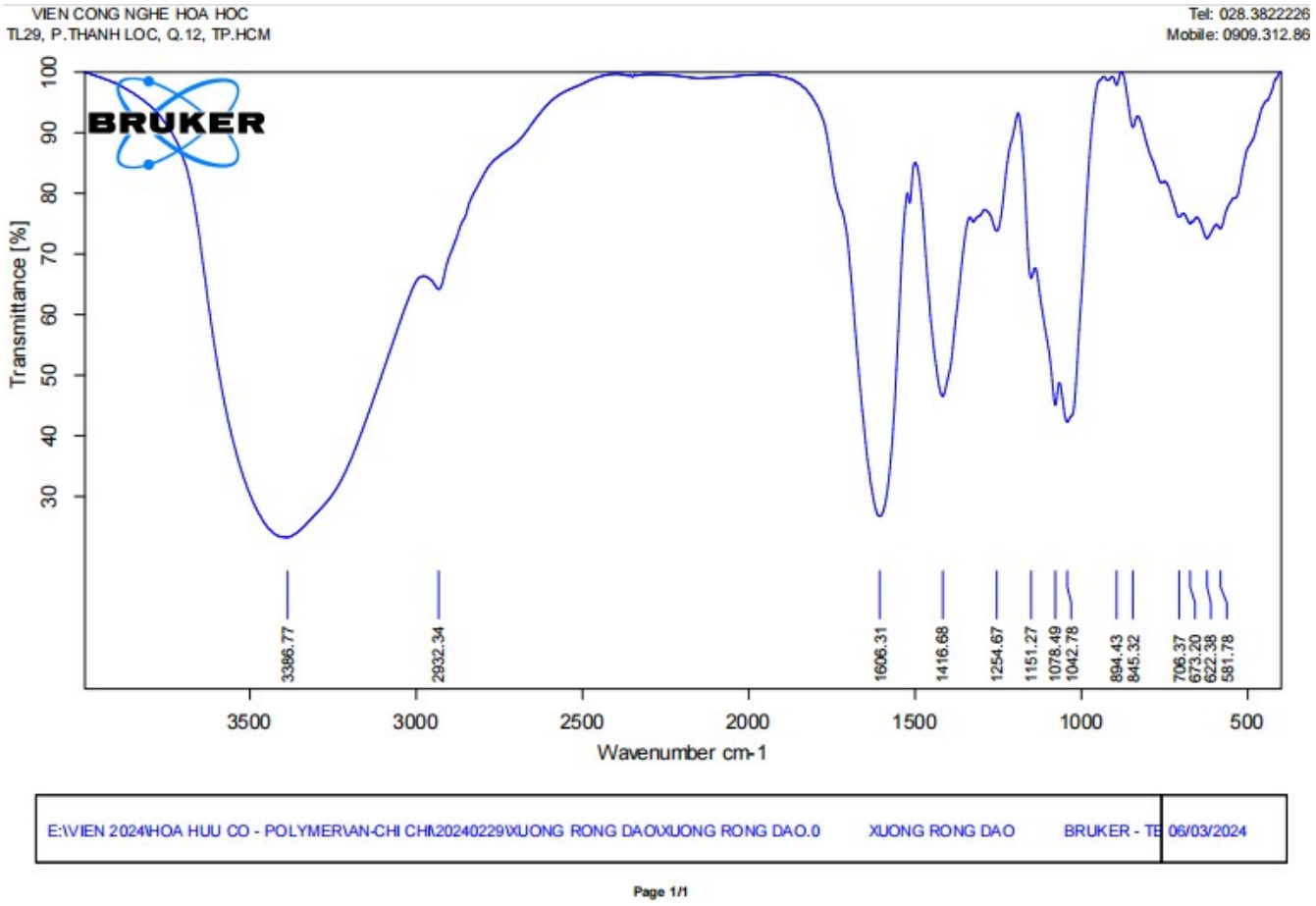

Figure S4. FTIR spectrum of pectin cactus

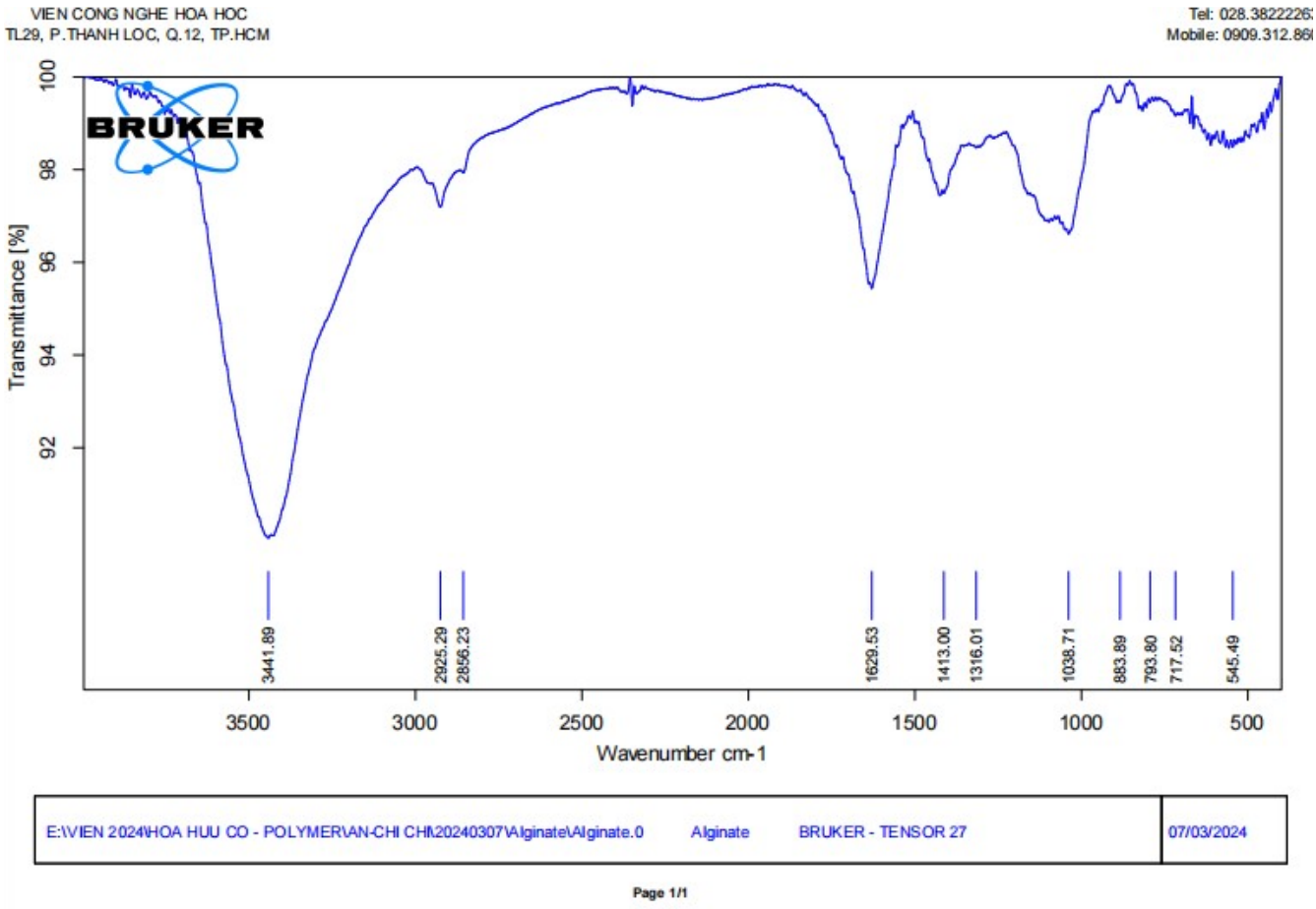

Figure S5. FTIR spectrum of alginate

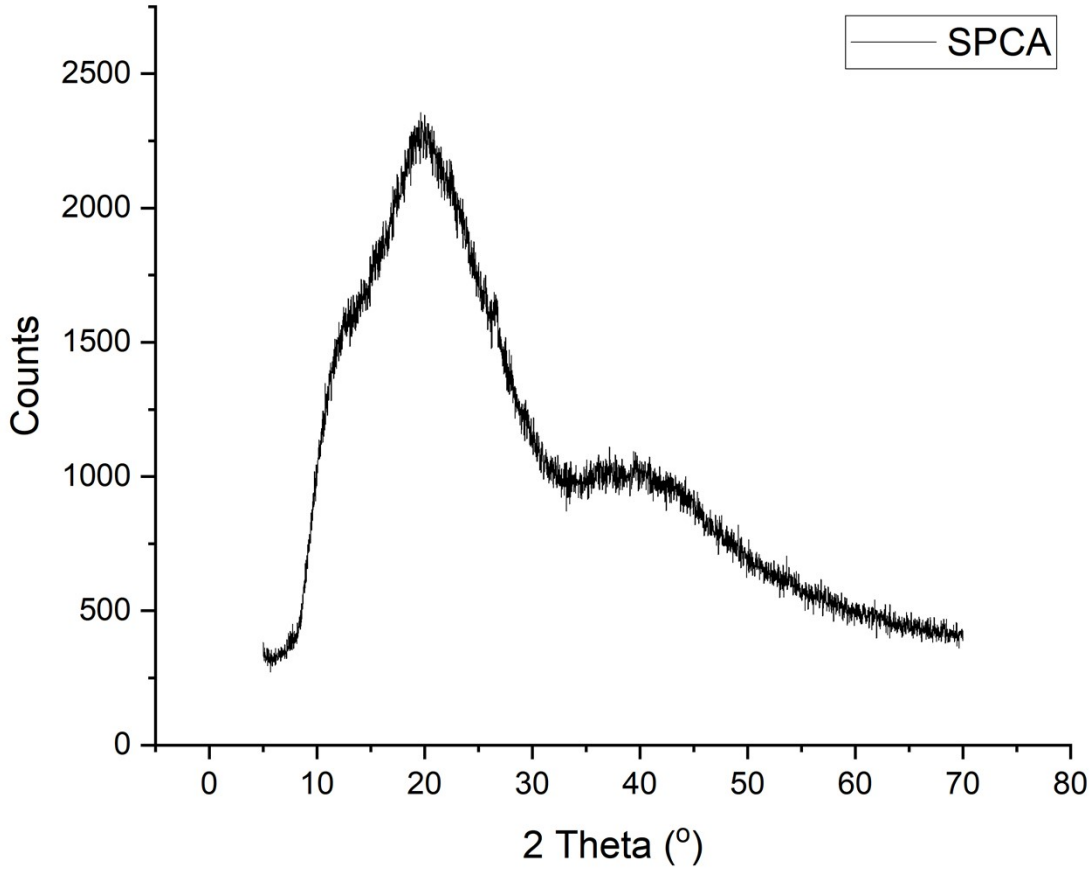

Figure S6. X-ray diffraction of SPCA

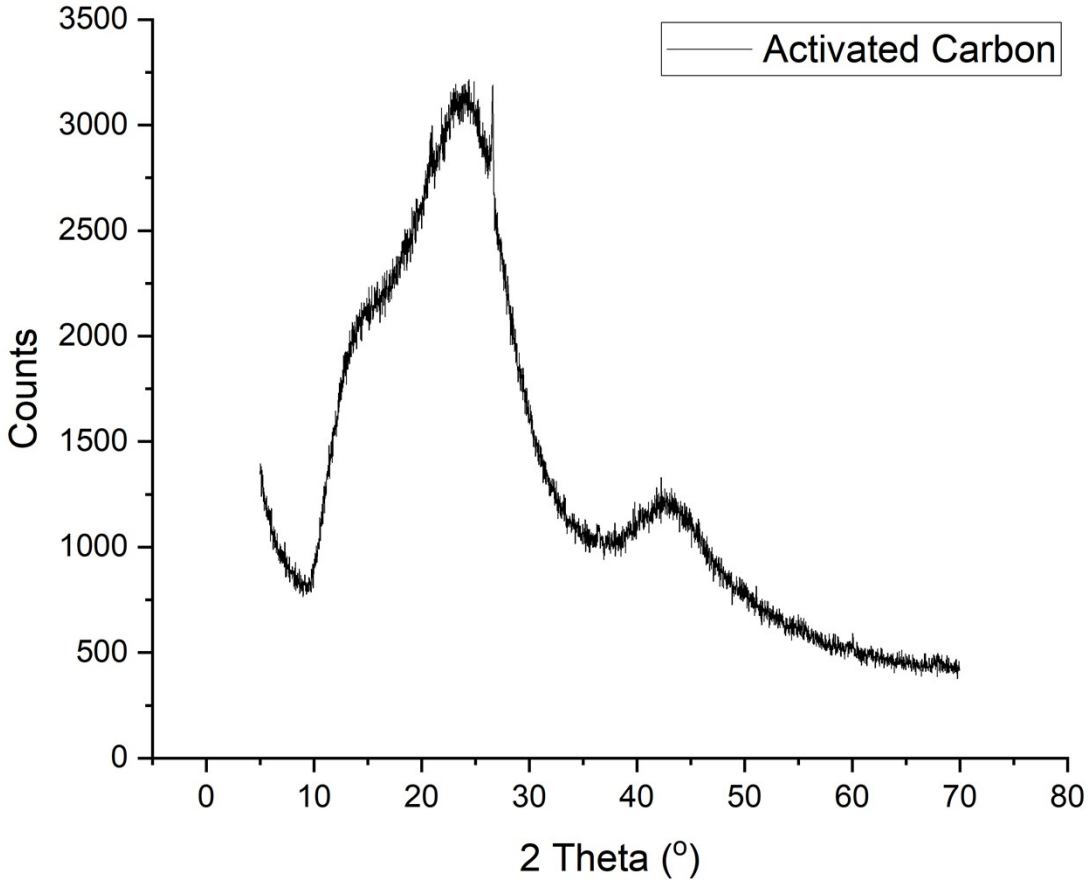

Figure S7. X-ray diffraction of activated carbon

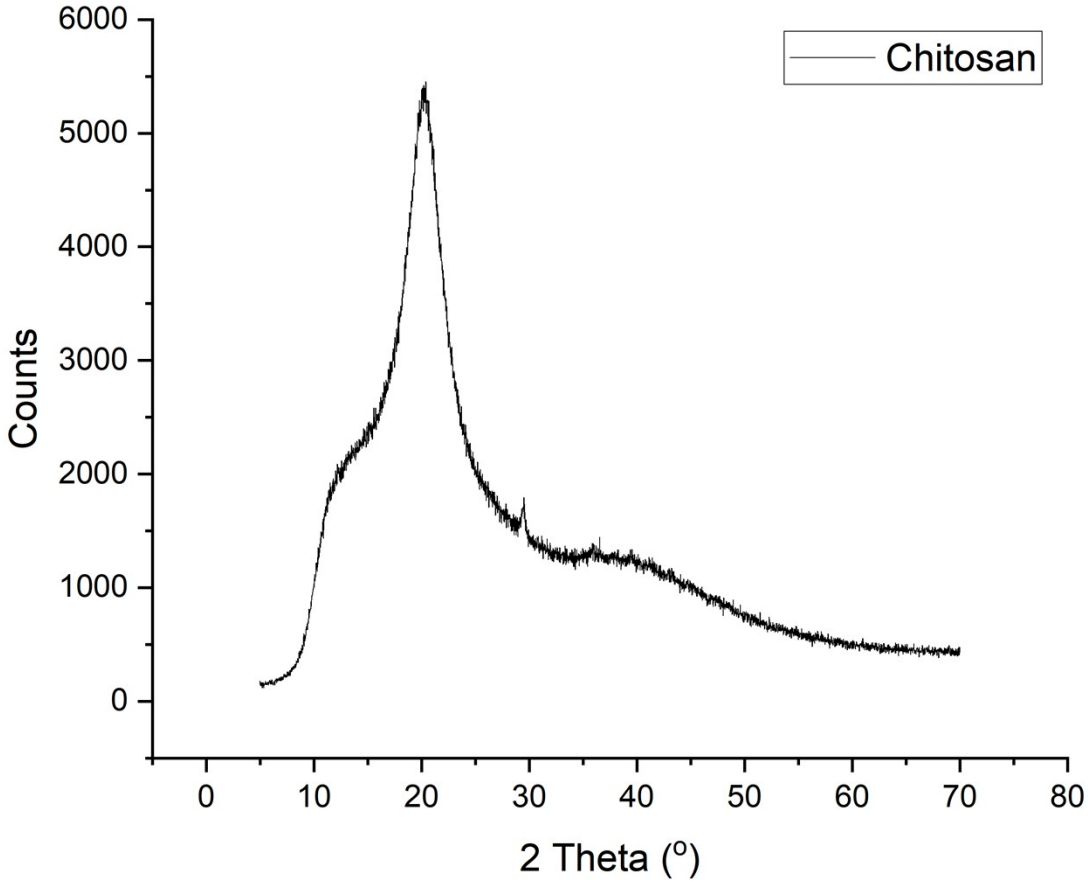

Figure S8. X-ray diffraction of chitosan

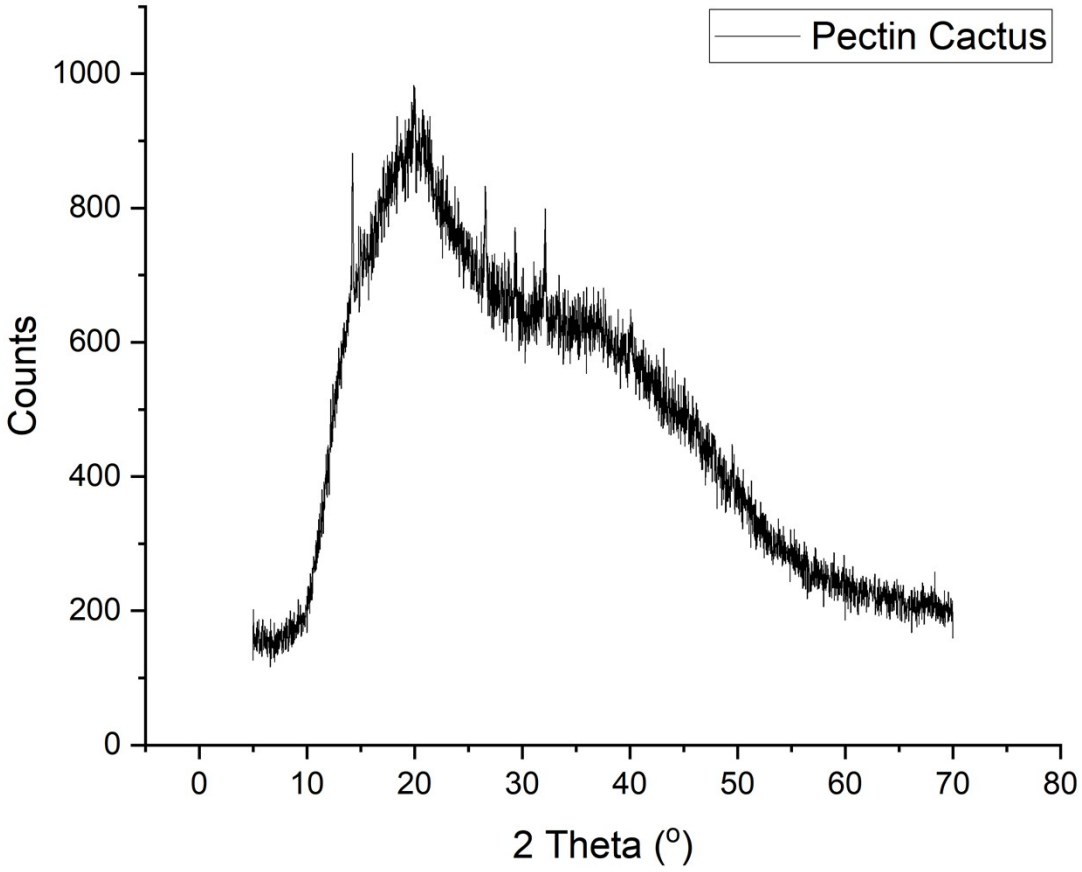

Figure S9. X-ray diffraction of pectin cactus

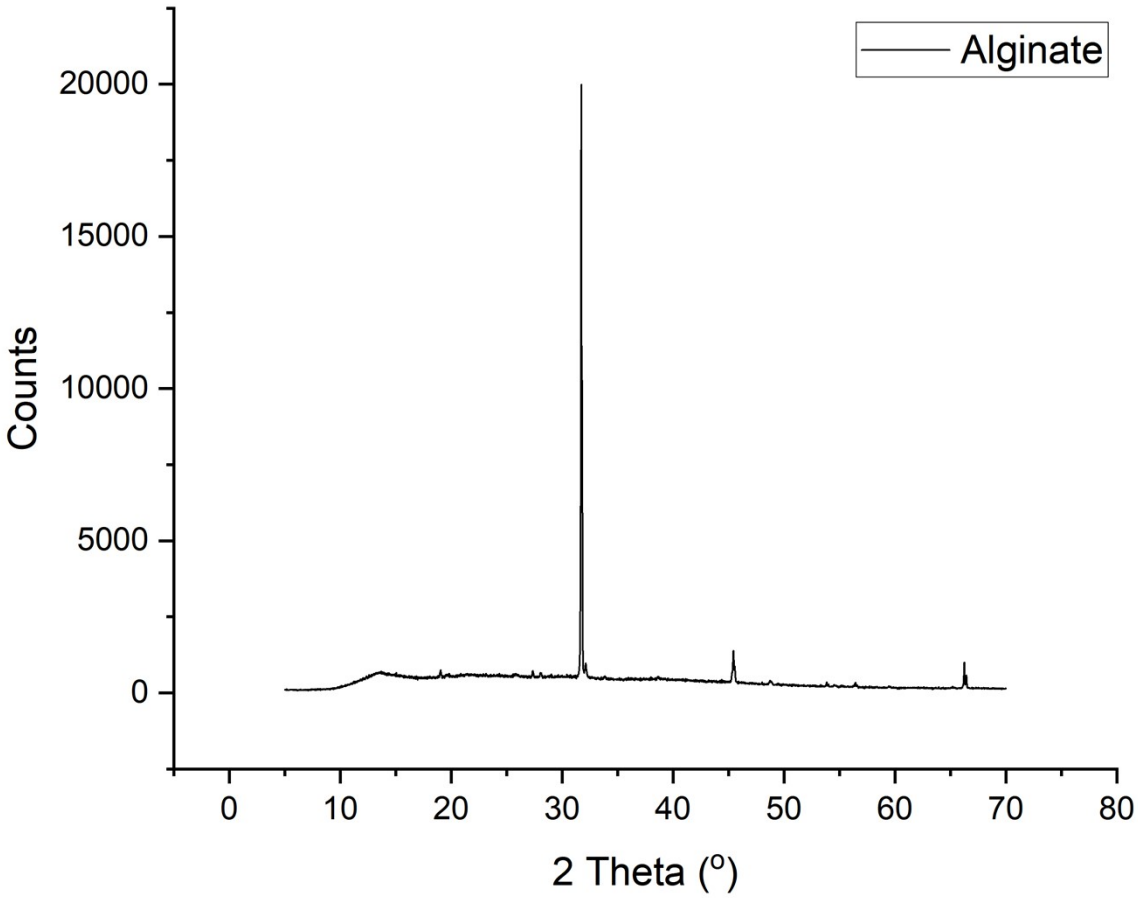

Figure S10. X-ray diffraction of alginate

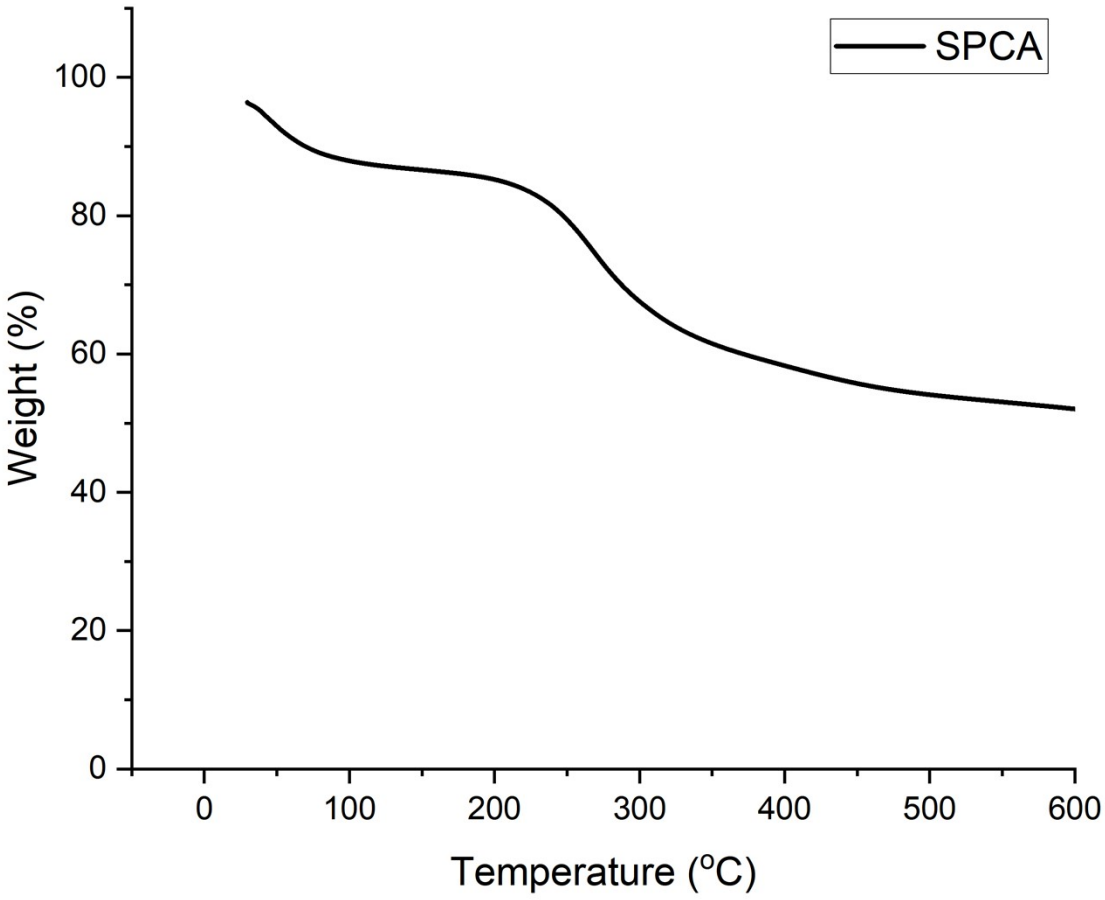

Figure S11. TGA of SPCA

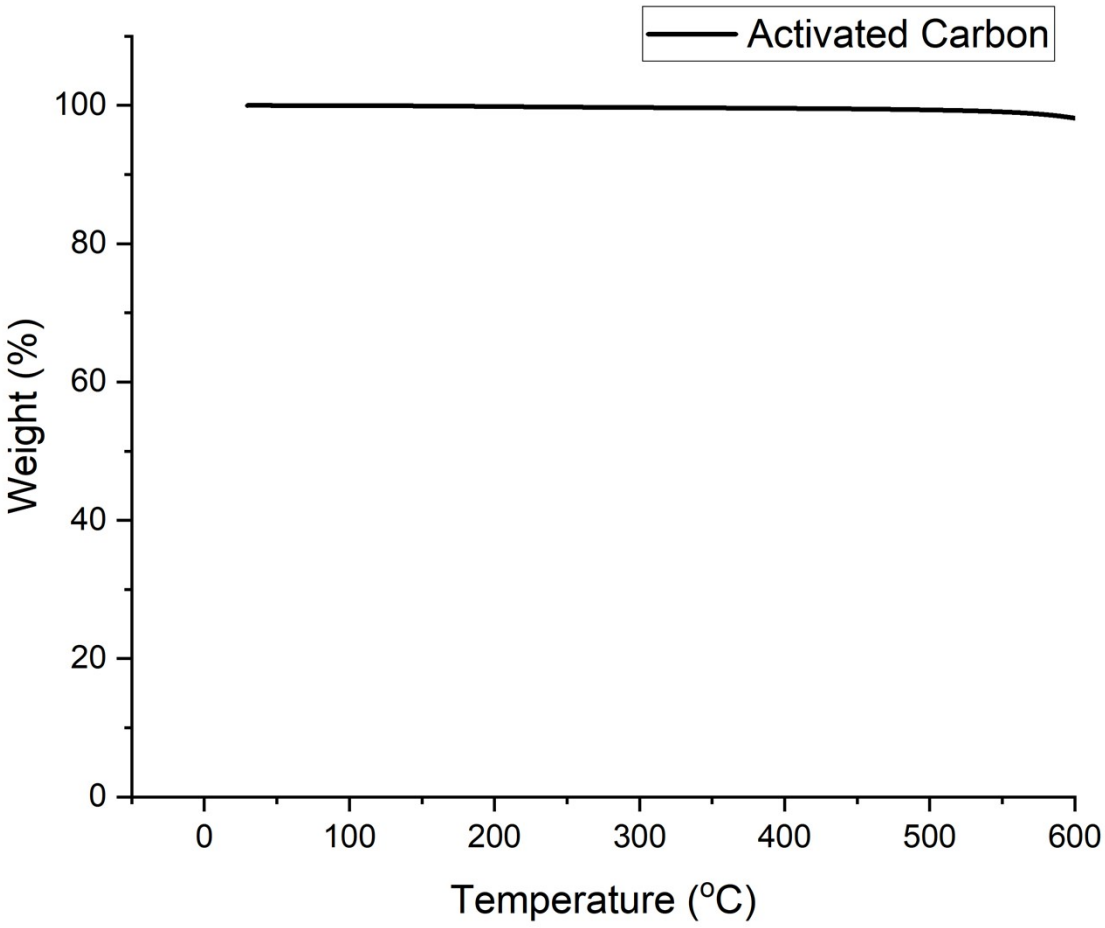

Figure S12. TGA of activated carbon

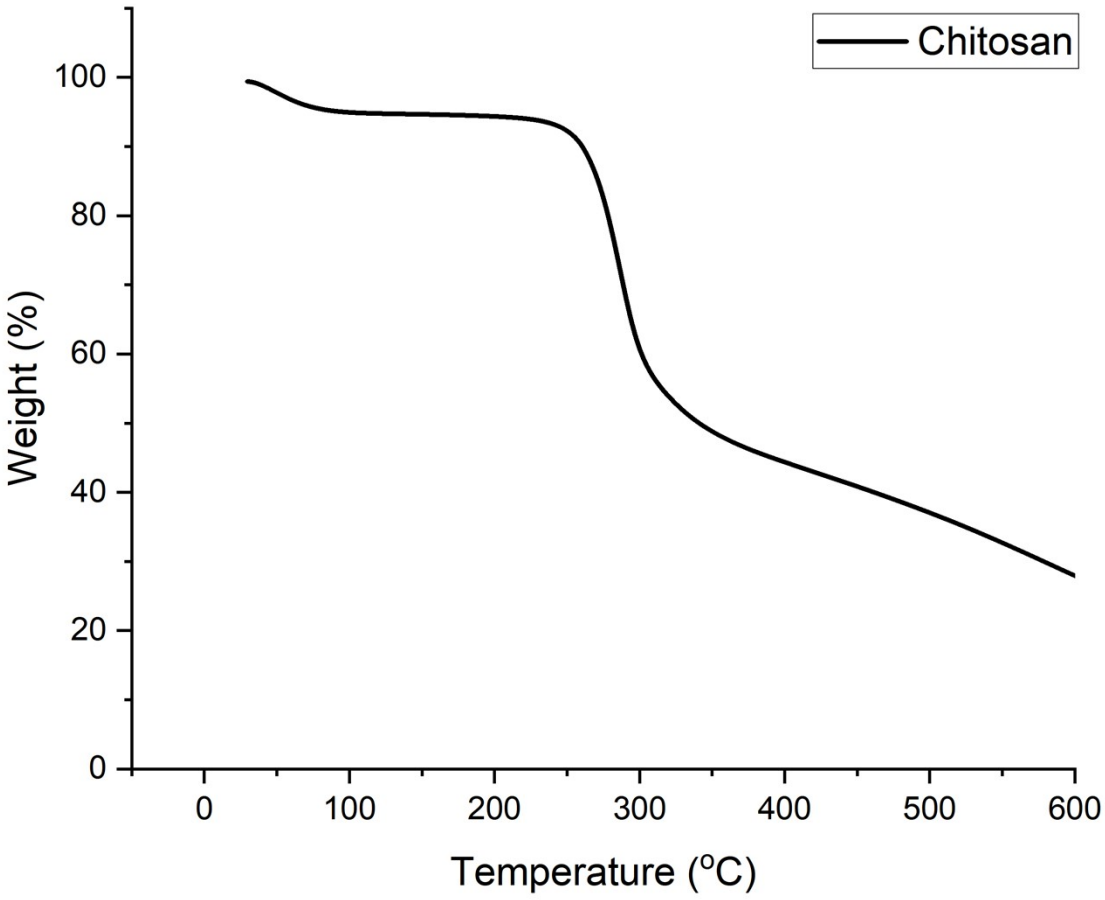

Figure S13. TGA of chitosan

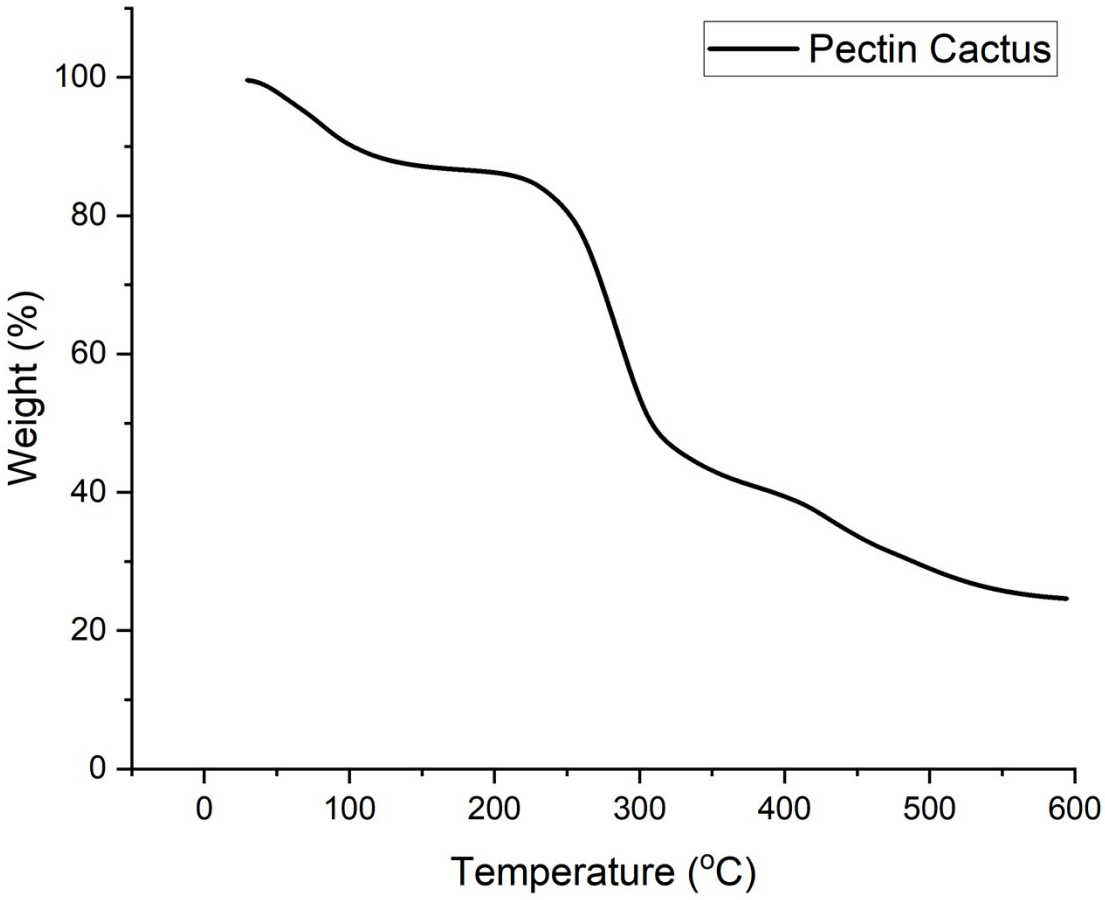

Figure S14. TGA of pectin cactus

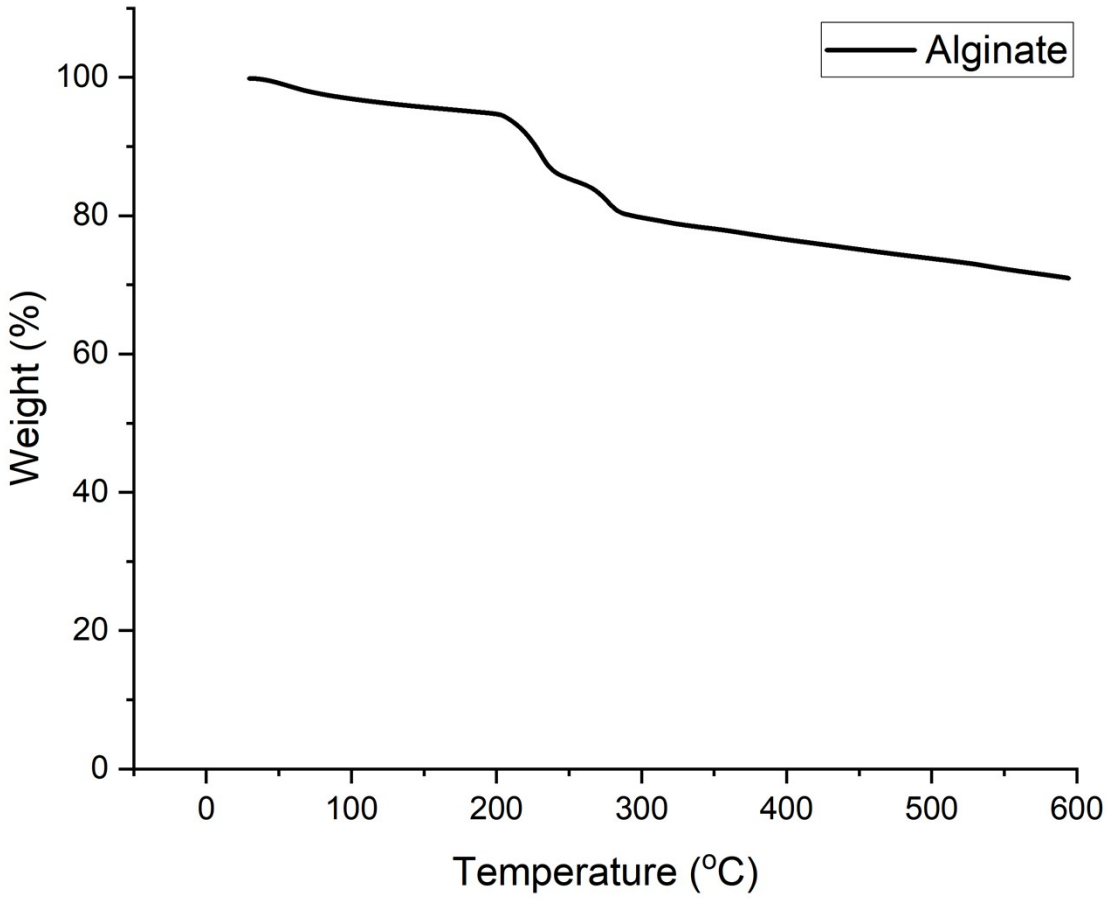

Figure S15. TGA of alginate

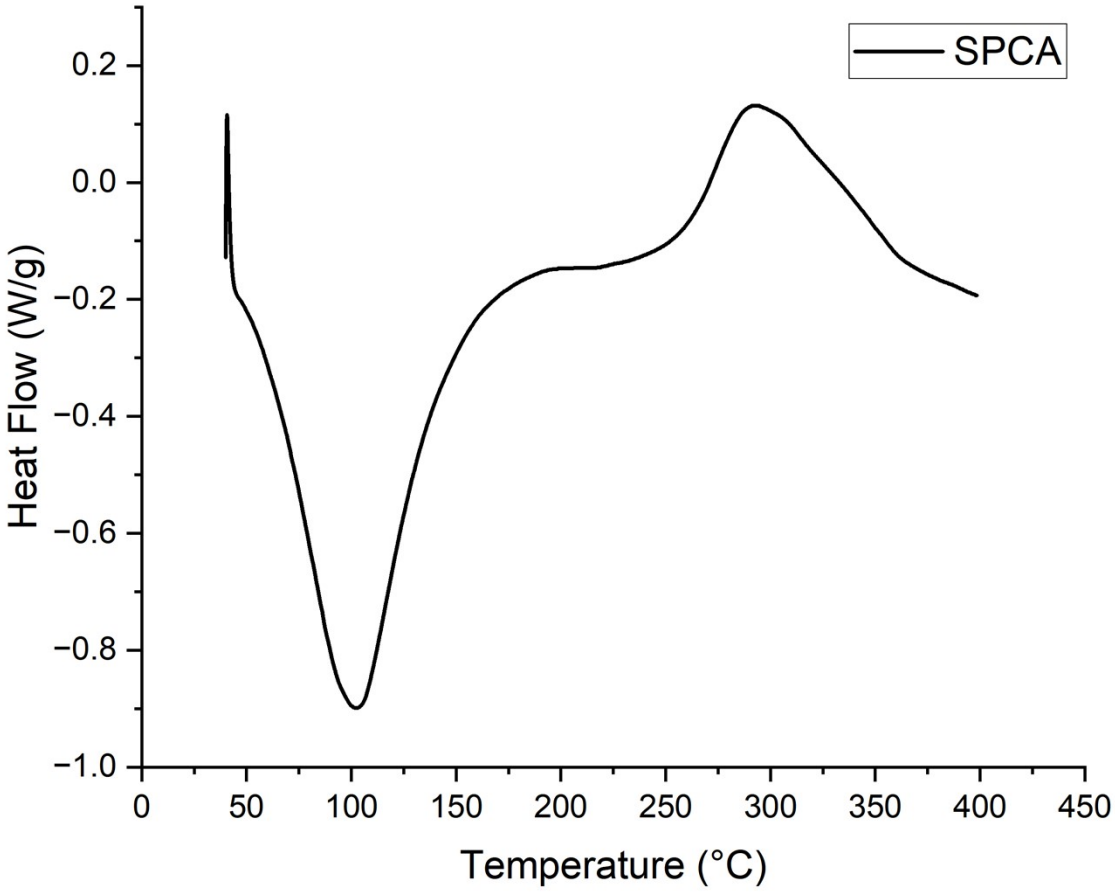

Figure S16. DSC of SPCA

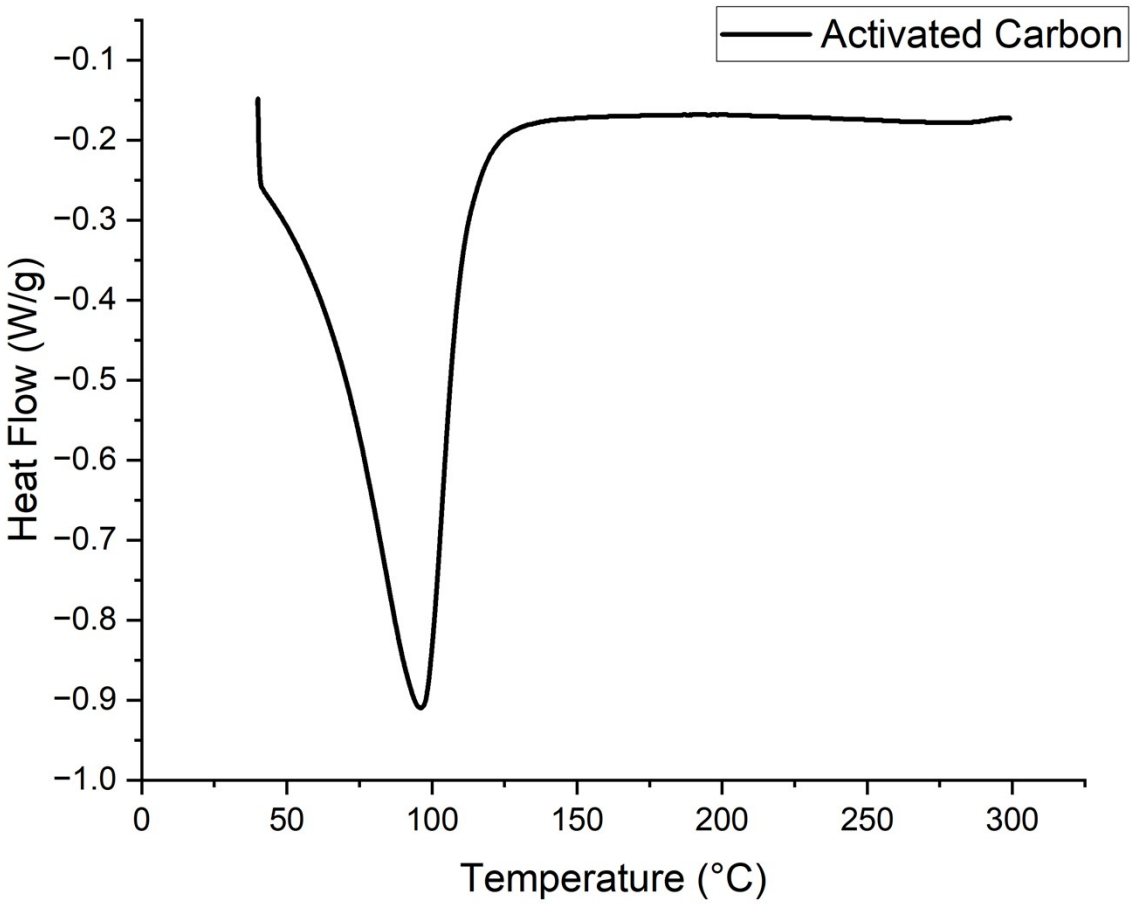

Figure S17. DSC of activated carbon

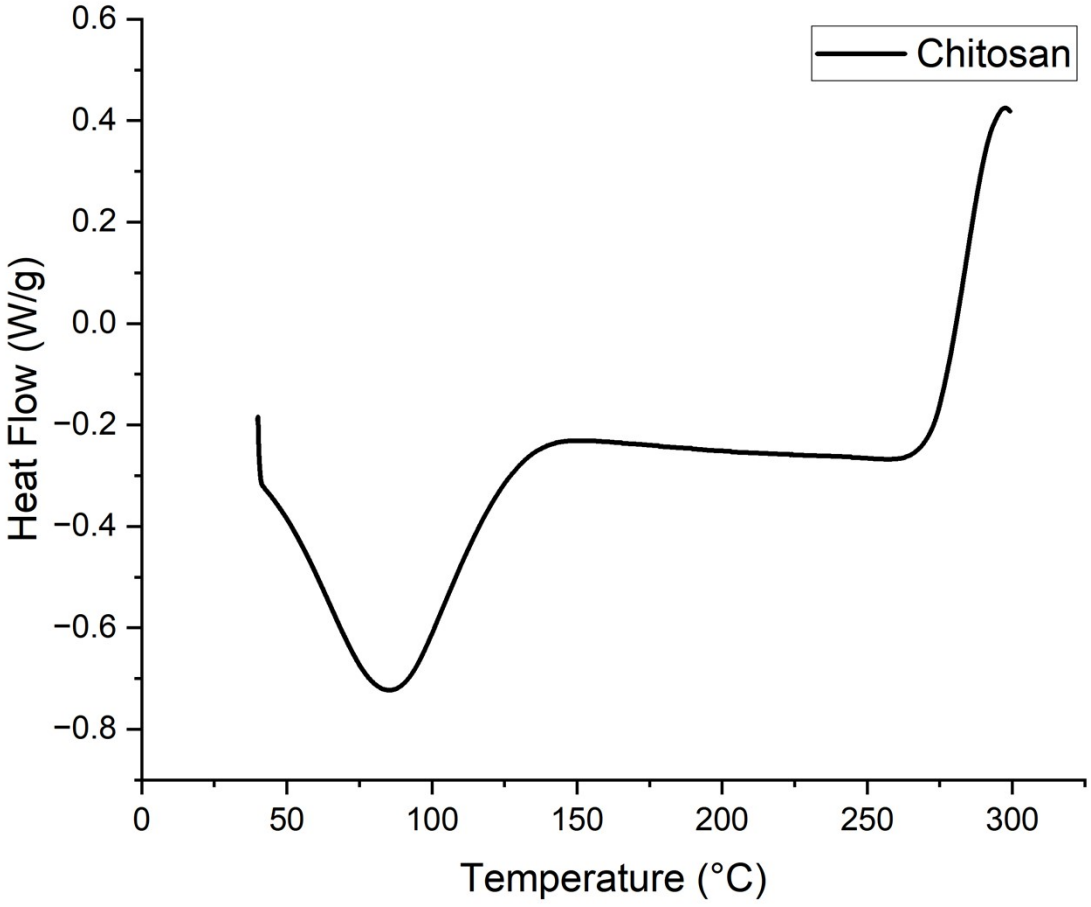

Figure S18. DSC of chitosan

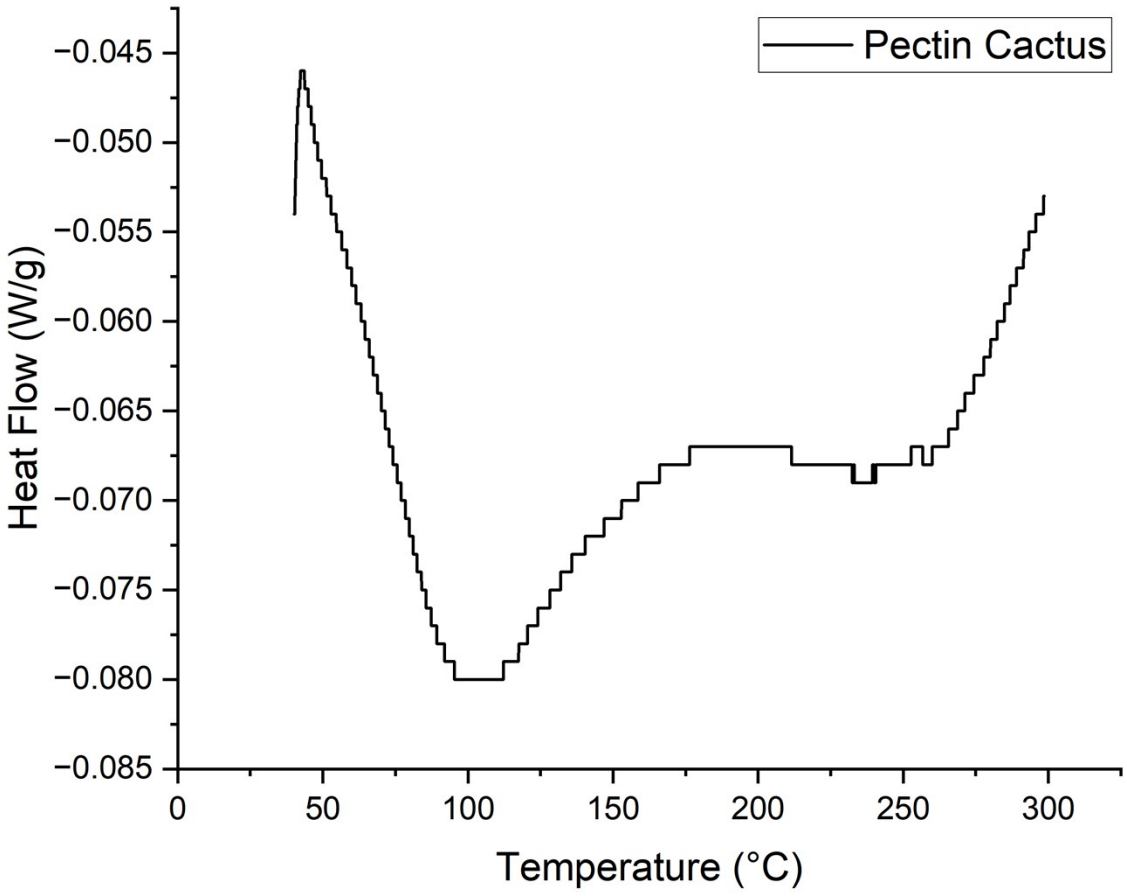

Figure S19. DSC of pectin cactus

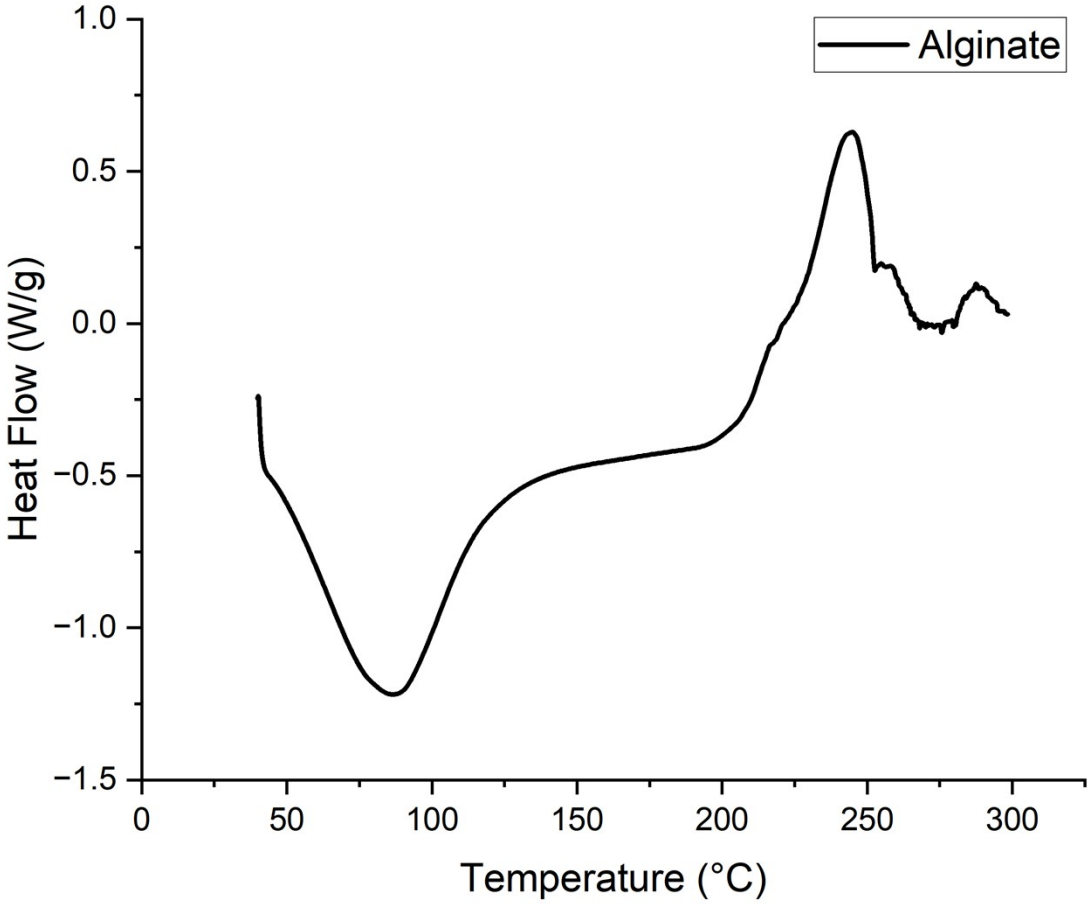

Figure S20. DSC of alginate

Table S1. Surface area, pore volume and pore diameter of SPCA before and after MO adsorption

Sample		Before MO adsorption	After MO adsorption
Surface area (m^2/g)		255.878	254.213
Pore volume (cm^3/g)	N_2 adsorption	0.119	0.099
	N_2 desorption	0.178	0.159
Average pore diameter (Å)	N_2 adsorption	25.45	22.17
	N_2 desorption	19.33	17.12

Table S2. Isotherm model parameters at 303 K

Parameters	Langmuir			Freundlich			Temkin		
	K_L	q_{max}	R^2	K_F	n	R^2	B_T	A_t	R^2
T = 303 K	0.40	21.46	0.9911	6.66	2.47	0.9945	4.20	4.98	0.9779

Table S3. Parameters of first-order pseudokinetic equations, second-order pseudokinetic equations, intra-particle diffusion equations, and Elovich equations

Parameters	PFO model			q_e, reality	PSO model		
	K_1 (1/h)	q_e, calculation	R^2		K_2 (g/mg.h)	q_e, calculation	R^2
100 ppm	1.35	7.26	0.9856	9.51	0.22	10.42	0.9985

Intraparticle diffusion model			Elovich model		
Kp ($mg/g.h^{0.5}$)	C (mg/g)	R^2	α (mg/g.h)	β (g/mg)	R^2
2.03	5.74	0.8361	234.43	0.6621	0.9020