SUPPLEMENTARY MATERIAL

Impact of heterogeneously crosslinked calcium alginate networks on the encapsulation of β-carotene-loaded beads

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Keywords: Calcium alginate networks; Heterogeneity crosslinking; Encapsulation; Barrier properties; Mechanical properties; β-carotene.

Methods

Scanning Electron Microscopy (SEM) analysis. The morphology of the prepared alginate-based films before and after crosslinking were analysed by SEM (Hitachi TM3030 Tabletop, Germany) equipped with EDS at accelerating voltage of 15 kV. The samples were cut into small squares and fixed on the aluminium stub using carbon tape.

Spectroscopy Fourier Transform Infrared (FTIR) – Attenuated Total Reflectance (ATR). FTIR spectra were obtained using a Spectrum Two PE instrument equipped with attenuated total reflectance (ATR) crystal (diamond crystal) (Frontier PerkinElmer Inc., United States). Samples were placed directly onto the ATR crystal and spectra were collected in transmittance mode. Spectra measurements were an average of 36 scans at 4 cm^{-1} resolution in the wavelength range of 4000 - 550 cm^{-1}.

Supplementary figures

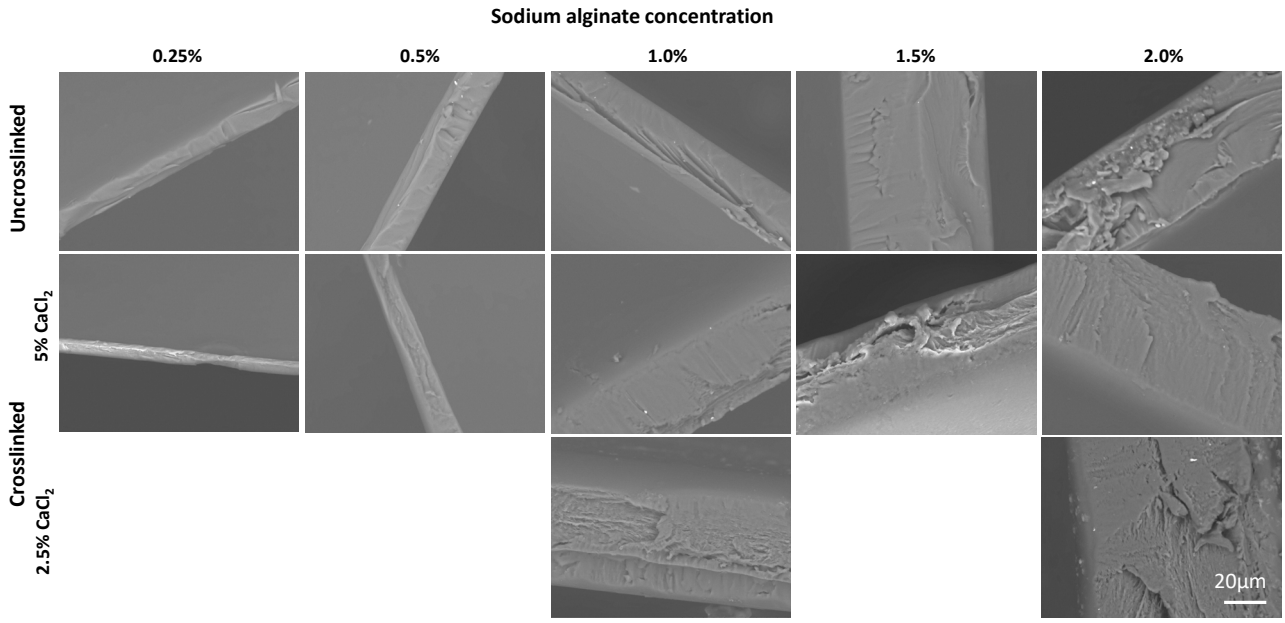

Figure S1. SEM micrographs of the sections of the alginate-based films before and after crosslinking.

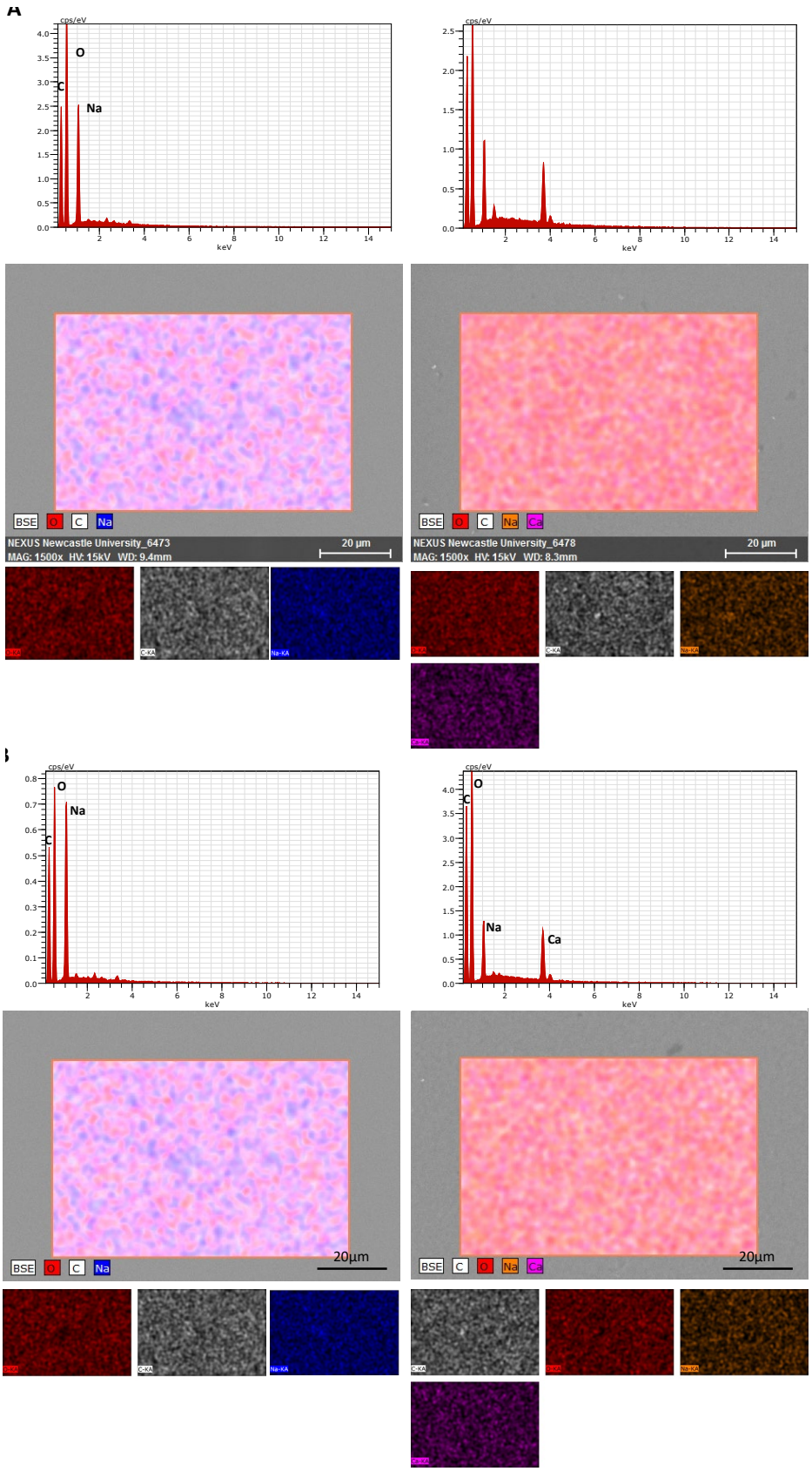

Figure S2. Representative spectra and elements colour mapping obtained by EDS analysis for the (**A**) 0.5% and (**B**) 2% alginate films before and after crosslinking (5% $CaCl_2$).

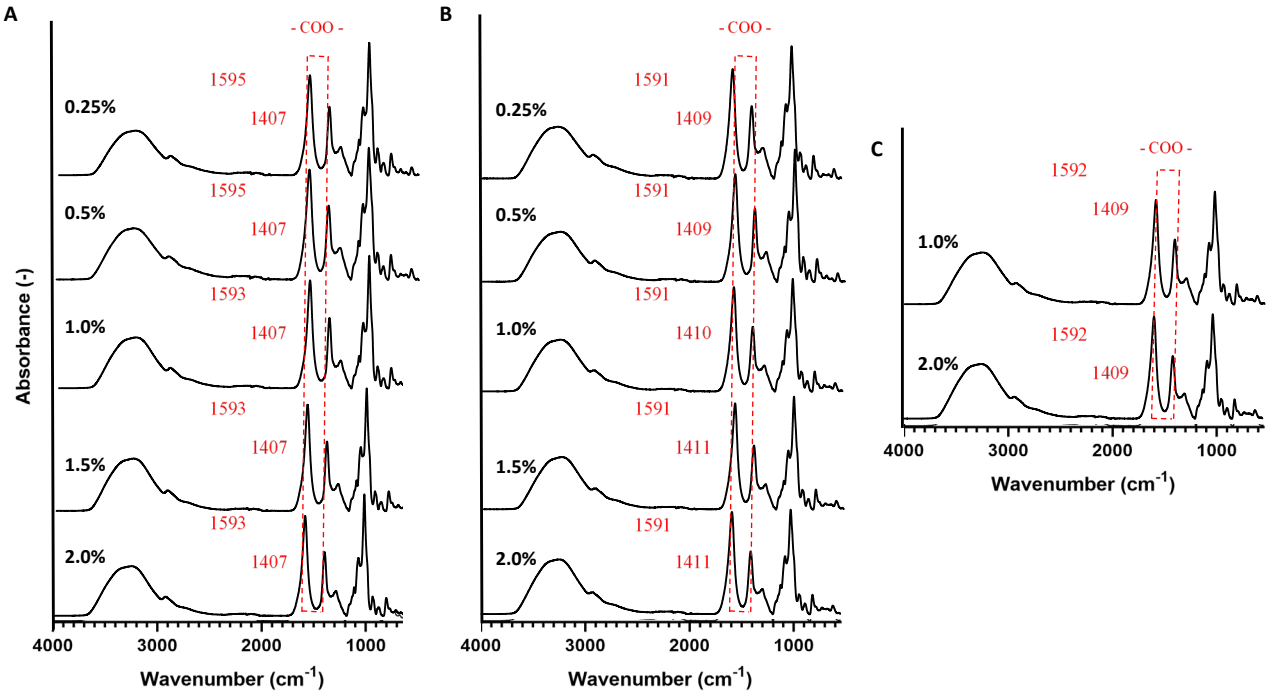

Figure S3. FTIR-ATR spectra of the alginate-based films before (**A**) and after crosslinking with 5% $CaCl_2$ (**B**) and 2.5% $CaCl_2$ (**C**) respectively.

Table S1. Atomic concentration of the characteristic elements present in the alginate-based films before and after crosslinking measured by EDS analysis.

Alginate (%)	Uncrosslinked				$CaCl_2$ (%)	Crosslinked			
	O	C	Na	Ca		O	C	Na	Ca
0.25	48.25	42.48	9.27	-	5	50.66	43.07	5.12	1.12
0.5	49.64	41.72	8.64	-		50.57	41.87	5.3	2.25
1	47.34	38.85	13.81	-		51.22	43.01	3.41	2.3
1.5	48.58	42.51	8.91	-		50.67	42.81	4	2.51
2	49.26	42.48	8.26	-		50.79	42.7	3.88	2.46
1					2.5	51.76	40.42	5.96	1.75
2						50.55	41.63	4.65	2.62