Development of bilayer polysaccharide-based films combining extrusion and electrospinning for active food packaging

Rodrigo F. Gouvêa, Cristina T. Andrade*

Universidade Federal do Rio de Janeiro, Programa de Pós-Graduação em Ciência de

Alimentos, Instituto de Química, Avenida Moniz Aragão 360, Bloco 8G/CT2

21941-594 Rio de Janeiro, RJ, Brazil

Corresponding author
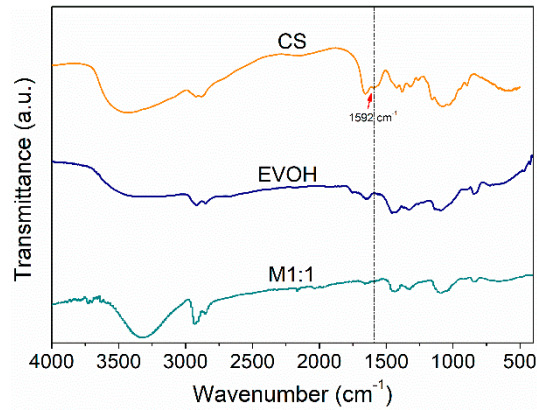
E-mail address: ctandrade@iq.ufrj.br

Figure S1 FTIR spectra for CS, EVOH and for the CS/EVOH electrospun film.

Table S1 Thickness, stress at break (σ_{max}), strain at break (ε_{max}) and Young's modulus (E) for the materials

Sample[a]	Average thickness* (µm)	σ_{max}* (MPa)	ε_{max}* (%)	E* (MPa)
TPS/MCC	248.5[a] ± 34.4	1.8[a,b] ± 0.8	2.0[a] ± 0.9	0.9[a,b] ± 0.0
SM	336.6[b] ± 51.6	0.9[b] ± 0.1	2.4[a] ± 0.4	0.6[a] ± 0.0
SM5	366.0[b] ± 24.1	1.3[b] ± 0.4	2.7[a] ± 0.6	0.6[a] ± 0.2
SM10	370.5[b] ± 38.5	1.7[a,b] ± 0.4	1.8[a] ± 0.9	1.4[b] ± 0.6
SM15	353.3[b] ± 82.1	2.2[a] ± 0.4	2.1[a] ± 0.2	1.3[b] ± 0.3

TPS/MCC, first layer composed of thermoplastic starch (TPS) incorporated with microcrystalline cellulose (MCC); SM, SM5, SM10 and SM15 bilayer films formed by deposition of electrospun nanofibers of chitosan/poly(ethylene-*co*-vinyl alcohol) mixed solution onto TPS/MCC layer with gallic acid at 0, 5.0, 10.0 and 15.0 mass% concentration, respectively.
*Means within a column with different letters are significantly different ($p < 0.05$).

Table S2 DPPH radical scavenging activity

Sample[a]	Radical scavenging activity* ($\mu mol.L^{-1}.Eq.Trolox.g^{-1}$)			Radical scavenging activity* (%)		
	GA extraction time in 95% ethanol					
	1 h	3 h	24 h	1 h	3 h	24 h
SM5	268.9[a]±19.1	324.8[a]±12.5	448.9[a]±66.7	15.9±1.5	19.2±0.9	26.5±4.2
SM10	238.8[a]±39.9	308.6[a]±30.8	624.4[a,b]±56.7	14.1±2.0	18.2±1.6	34.8±2.1
SM15	512.5[b]±36.3	554.4[b]±58.5	903.8[b]±62.2	30.3±2.9	32.8±4.4	53.5±3.0

[a]SM5, SM10 and SM15 are bilayer films formed by deposition of electrospun nanofibers of chitosan/poly(ethylene-*co*-vinyl alcohol) mixed solution with gallic acid at 5.0, 10.0 and 15.0 mass% concentration, respectively, onto extruded TPS/MCC layer.
* Means within a column with different letters are significantly different ($p < 0.05$).