

Disordering of Starch Films as a Factor Influencing the Release Rate of Biologically Active Substances

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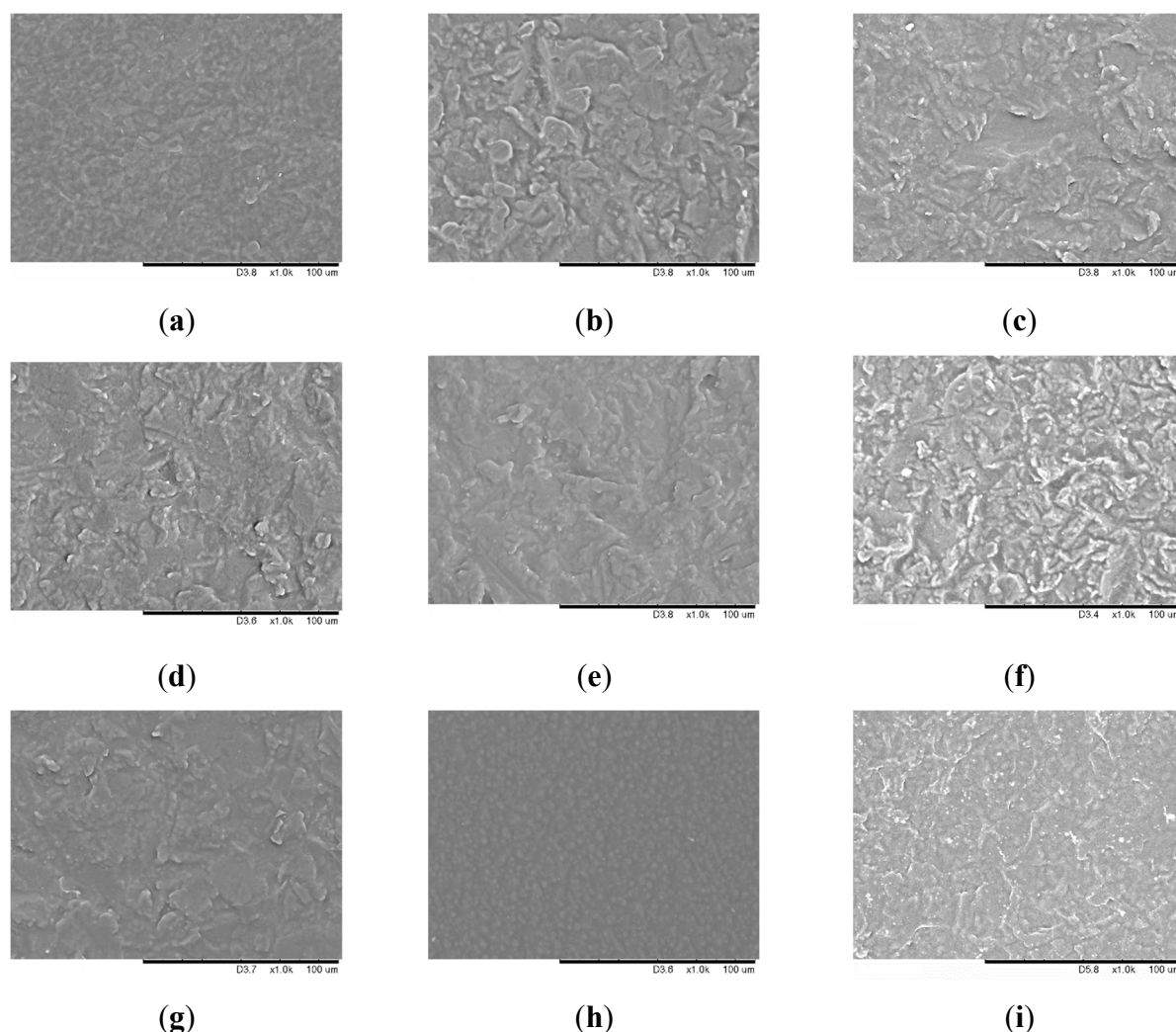


Figure S1. Micro images of native starch films and films prepared from starch treated mechanically for 30 and 600 s: corn (a–c), potato (d–f), and tapioca starch (g–i).

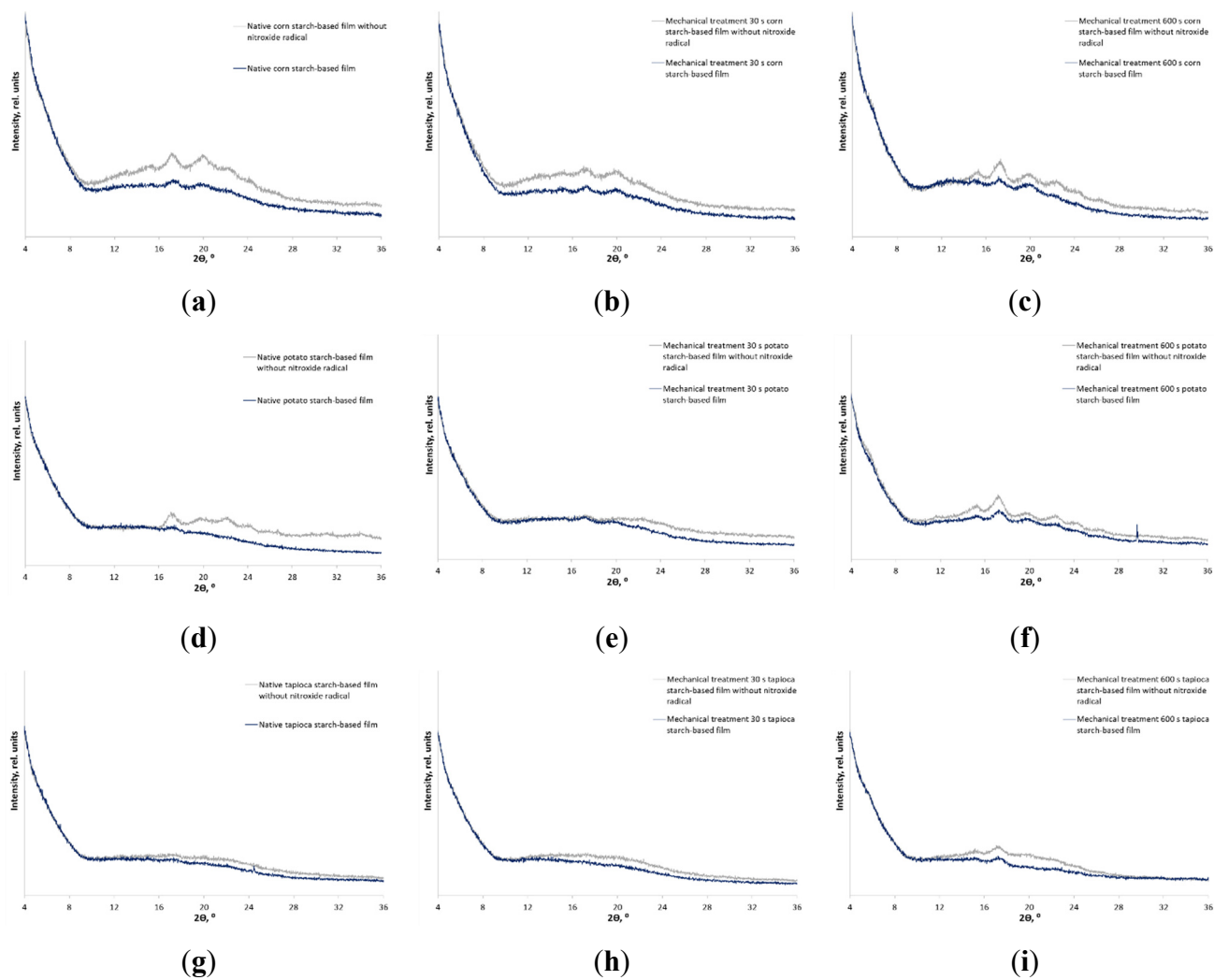


Figure S2. X-ray diffraction patterns of the films based on native starch and starch mechanically treated for 30 and 600 s with and without 3-carboxy-PROXYL added: corn (a–c), potato (d–f), and tapioca starch (g–i).

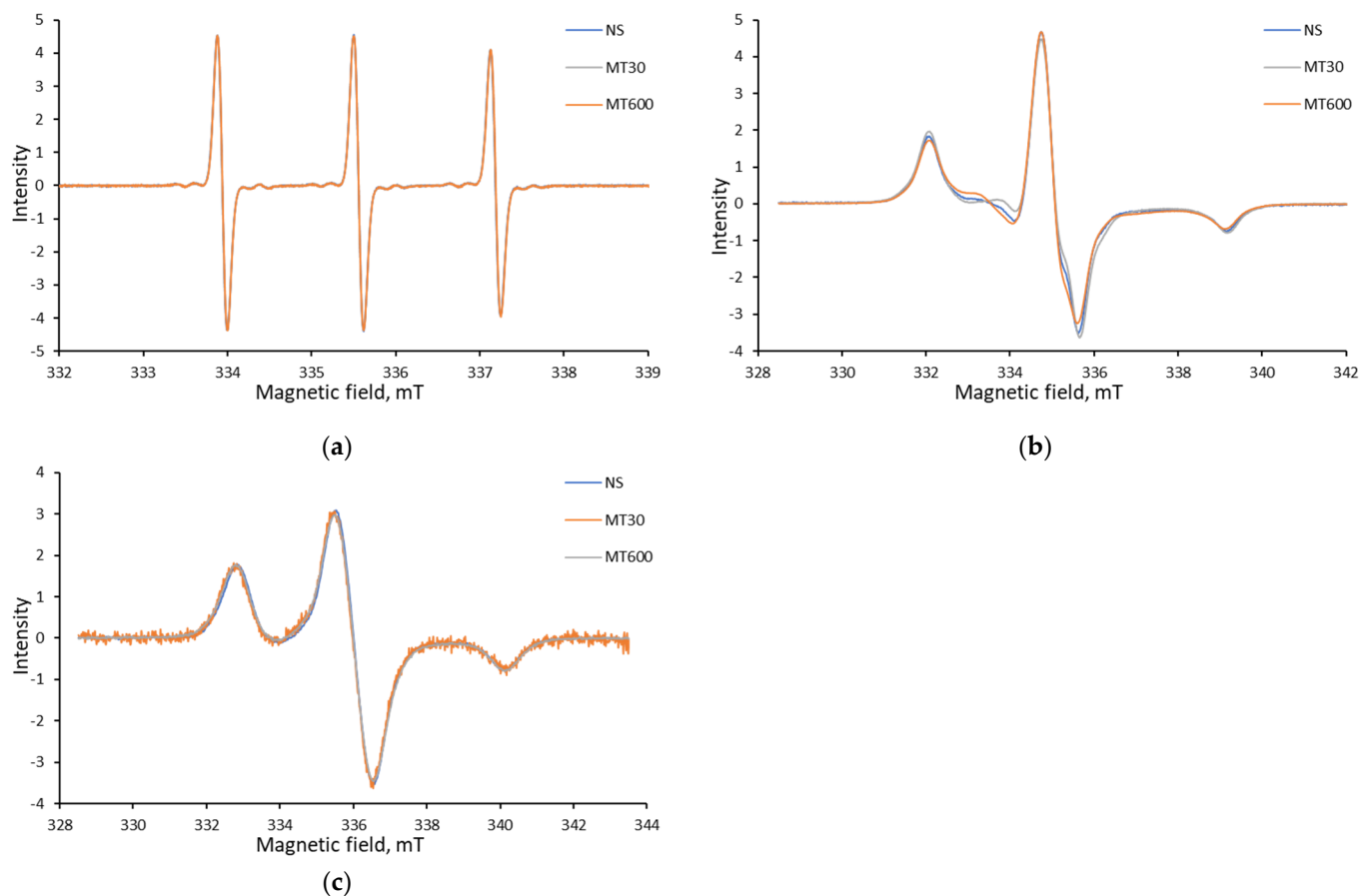


Figure S3. The characteristic EPR spectra of 3-carboxy-PROXYL nitroxide radical for corn starch: in the liquid state (a); in the film at room temperature (b); and the stabilized spectrum at -196°C (c).

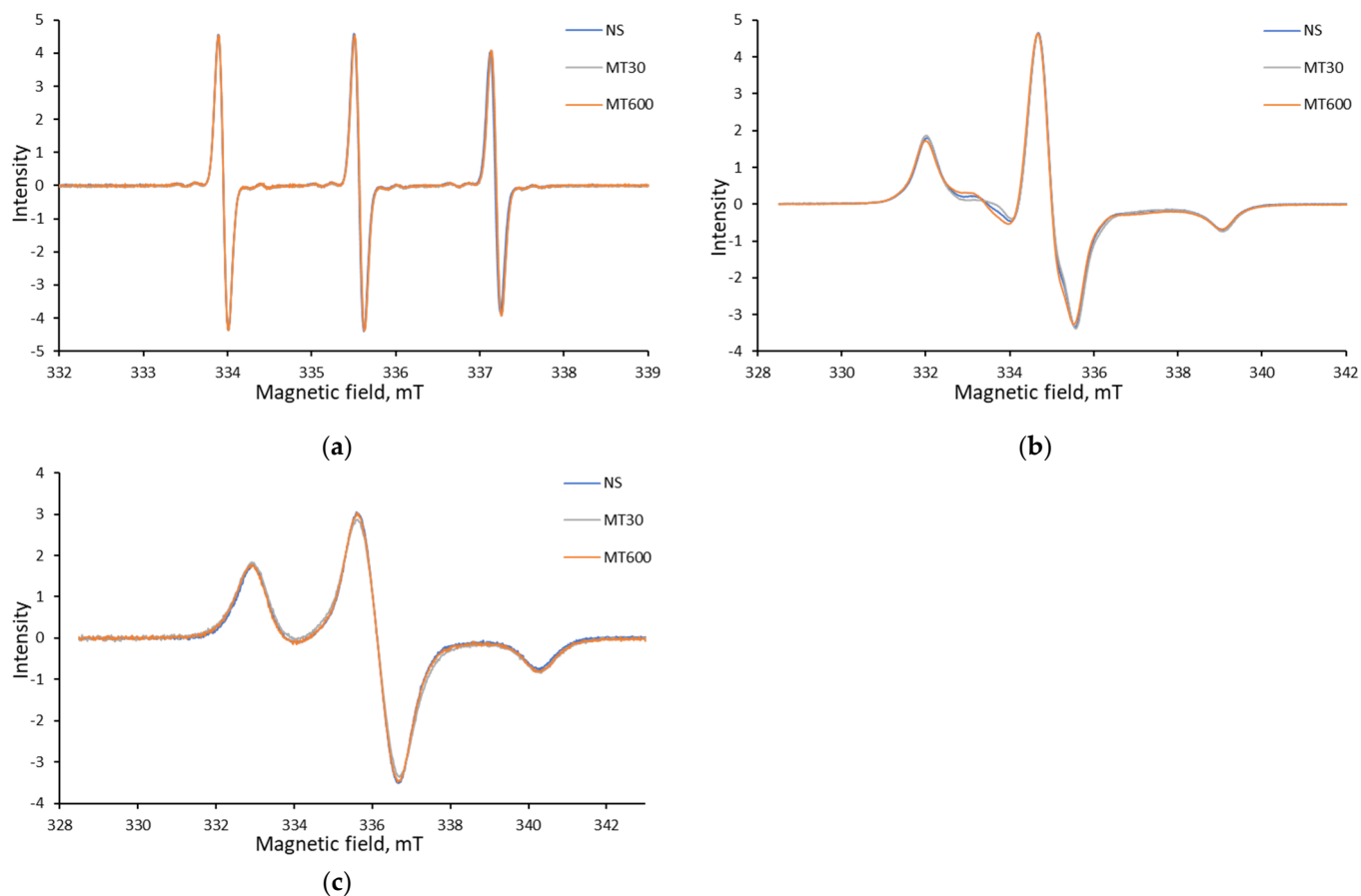


Figure S4. The characteristic EPR spectra of 3-carboxy-PROXYL nitroxide radical for tapioca starch: in the liquid state (a); in the film at room temperature (b); and the stabilized spectrum at -196°C (c).

Table S1. The key physicochemical characteristics of films based on native starch and starch with different disordering degrees (without 3-carboxy-PROXYL added).

Starting material	Type	Crystallinity index, %	Film thickness, μm
Corn starch-based film			
NS ¹	A-type	19 ± 1	118 ± 8
MT30 ²	A-type	11 ± 1	85 ± 3
MT600 ³	B-type	22 ± 1 ^a	89 ± 12 ^b
Potato starch-based film			
NS	B-type	25 ± 1	143 ± 8
MT30	B-type	17 ± 1	88 ± 4
MT600	B-type	26 ± 2 ^a	91 ± 6 ^b
Tapioca starch-based film			
NS	C-type	11 ± 1	136 ± 14
MT30	C-type	8 ± 1 ^a	75 ± 15
MT600	B-type	19 ± 1	70 ± 5 ^b

Data are presented as mean \pm SD. ¹ NS – native starch; ² MT30 – starch after mechanical treatment for 30 s; ³ MT600 – starch after mechanical treatment for 600 s. ^a No significant differences compared to NS samples (p -value ≥ 0.05). ^b No significant differences compared to MT30 samples (p -value ≥ 0.05).