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## Supporting Information

## Sprayable oxidized polyvinyl alcohol with improved degradability and

## sufficient mechanical property for fruit preservation

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## Supplementary figure captions



Fig S1. XPS surveys of different PVA and OPVA samples.



Fig S2. Degrees of crystallinity of different PVA and OPVA samples. All statistical data are represented as mean  $\pm$  SD (n = 3).



Fig S3. SAXS patterns of different PVA and OPVA films.



Fig S4. Digital images of PVA and OPVA buried in soil for 7 days.



Fig S5. Microscope images of PVA and OPVA buried in soil for 7 days.



Fig S6. Oxidation and microbial enzyme degradation processes of PVA.



**Fig S7. Water welding behavior of OPVA film.** (A) Schematic illustration of water welding behavior of OPVA strip. (B) Schematic diagram of preparing OPVA film-based packaging bags and ziplock bags. (C) Photographs of utilizing OPVA film-based bags for holding different items (scale bar = 1 cm). (D) Stress–strain curves of pristine and water-welded OPVA films.



Fig S8. Stress-strain curves of recycled OPVA film.



**Fig S9.** Weight loss of bare and coated A) bananas, B) strawberries, and C) tomatoes as a function of time. All statistical data are represented as mean  $\pm$  SD (n = 3; \*P < 0.05, \*\*P < 0.01).



Fig S10. Curves of body weight variations in mice after gavage. All statistical data are represented as mean  $\pm$  SD (n = 3).

Table S1. Molecular weights and distributions of PVA and OPVA samples by GPC analysis

Sample	$M_{\rm n}$ (× 10 <sup>4</sup> g·mol <sup>-1</sup> )	$M_{ m w}$ (× 10 <sup>4</sup> g·mol <sup>-1</sup> )	PDI <sup>(a)</sup>
PVA	4.21	6.42	1.52
OPVA-0.5	1.99	5.65	2.83
OPVA-1.0	1.93	4.60	2.38
OPVA-1.5	1.59	3.94	2.48
a) (PDI = $M_{\rm n}/M_{\rm w}$ )			

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Method	Spraying	Dipping	Brushing
Concentration	10% ( <i>W/W</i> )	15% ( <i>W/W</i> )	20% ( <i>W/W</i> )
Application advantages	Any shaped fruit	Smaller fruits in volume	Smooth skinned fruits
	(e.g., banana)	(e.g., strawberry)	(e.g., mango)

Table S2. Applications and advantages of three film-forming methods

**Movie S1.** OPVA-1.0 sample was applied to loquats through dip coating or/and spray coating, and was successfully removed after film formation.

Movie S2. Changes in fruit freshness of coated and uncoated strawberries over time.

Movie S3. Changes in fruit freshness of coated and uncoated bananas over time.

Movie S4. Changes in fruit freshness of coated and uncoated mangos over time.