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# Factors affecting water resistance of alginate/gellan blend films on paper cups for hot drinks

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## Highlights

- Miscibility between NaAlg and gellan gum was verified via FTIR, XRD, DSC and PALS.
- The films were adhered to the paper which absorbed the moisture through the films.
- The crosslinking method and the new test method of water resistance are reliable.
- Water resistance of the blend film is better than the pure films.
- The six factors examined significantly affected water resistance.

**Abstract** Enhanced film water resistance of paper cups was achieved by physically blending sodium alginate (NaAlg) and gellan gum with crosslinking treatment. Pure and blended films were prepared and characterized via Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), differential scanning calorimetry (DSC), and positron annihilation lifetime spectroscopy (PALS). Results demonstrated excellent compatibility between the two polysaccharides. Total mixed solution concentration, component ratio, glycerol content,  $\text{Ca}^{2+}$  concentration, crosslinking time, and dry temperature affected water resistance. Water permeability (WP) and swelling degree (SD) were tested. Optimal conditions were as follows: total mixed solution concentration, 2.4% (m/v); component ratio, 2:1; glycerol content, 0.5% (m/v);  $\text{Ca}^{2+}$  concentration, 5% (m/v); crosslinking time, 5 min; and dry temperature, 50 °C. WP and SD values were  $78.1 \times 10^{-8}$  g/msPa and 66.3%, respectively. Properties of the films showed the synergistic effect between NaAlg and gellan, which can be used for water-resistant film coating on paper cups for hot drinks.

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