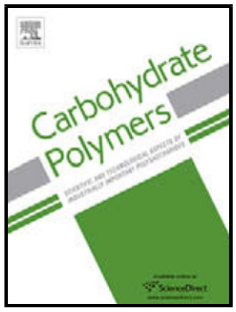


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# Preparation, characterization, and properties of fluorine-free superhydrophobic paper based on layer-by-layer assembly

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## Highlights

- 1. A facile approach to fabricate fluorine-free superhydrophobic paper was proposed.
- 2. The method relied on combination of layer-by-layer assembly and silane post-treatment.
- 3. Tensile strength of obtained superhydrophobic paper was enhanced.
- 4. Superhydrophobic paper was low bacterial adhesion, self-cleaning and high durability.
- 5. Superhydrophobic paper exhibited moisture-proofing property.

**Abstract**: A fluorine-free superhydrophobic paper was prepared by a facile method involving layer-by-layer deposition of cationic starch and sodium alginate together with subsequent modification of trichloromethylsilane has been reported in this article. The surface chemical compositions, potentials and surface morphologies of the modified papers were characterized, respectively. The wetting abilities and physical strength properties of the modified papers were investigated. After 4-time deposition of cationic starch/sodium alginate bilayer followed by trichloromethylsilane treatment, the water contact angle of modified paper reached up to 161.7°, and the tensile strength increased by 6.8% in comparison to that of pristine paper. This as-prepared superhydrophobic paper not only showed low bacterial adhesion property, self-cleaning behavior, water repellency, as well as high durability against deformation, chemical and time, but also kept a high strength property under high relative humidity condition, which might has a great application potential in the liquid paper packaging industry.

**Keywords**: Layer-by-layer; Superhydrophobic paper; Moisture resistance; Cationic starch; Alginate

### 1. Introduction

Plastics is one of indispensable packaging materials in modern society because of its unique characters, such as durability, low cost, proper mechanical strength and barrier properties against water (Hu, Gao, Chen, & Chen, 2014). However, the usage of plastic products not only consumes non-renewable petrochemicals,