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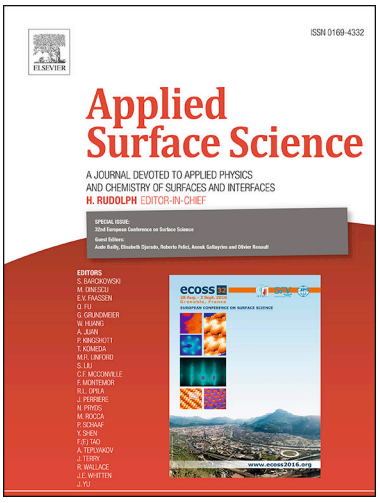

Full Length Article

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Micrometer-sized spherulites as building blocks for lotus leaf-like superhydrophobic coatings

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Abstract

Micropapillae covered by nanometer-sized wax crystals are essential building blocks of lotus leaf surface for repelling water and self-cleaning. It is generally time-consuming and complex to construct similar artificial micropapillae covered by nanometer-sized protuberances in the fabrication of superhydrophobic coatings without the aid of nanomaterials or special materials. We develop a cost-efficient strategy to simplify the fabrication process of lotus leaf-like superhydrophobic coatings by using micrometer-sized spherulites as building blocks. Well-controlled lotus leaf-like superhydrophobic coatings were prepared from hydrogenated castor oil spherulites through a one-step solution-immersion process. The result coatings have water contact angles over 150° and water shedding angles below 10°. It was demonstrated that micrometer-sized spherulites originated from common material could easily form lotus leaf-like superhydrophobic coatings on different materials through simple crystallization process.

Keywords: micrometer-sized spherulites; lotus leaf-like; superhydrophobic coating; hydrogenated castor oil

1 Introduction

Micropapillae covered by nanometer-sized wax crystals play key role in trapping enough air beneath the water drops and minimizing the contact area of water drops on the lotus leaf surface. [1-4] Morphologically well-defined lotus leaf surface provides an object that researchers can use to evaluate the water repellence of materials. Benefit from it, variety of elegant superhydrophobic coatings with similar hierarchical micro/nanostructures (e.g., lotus leaf-like, [5-8] fiber-like, [9] raspberry-like, [10, 11] needle-like, [12, 13] flower-like, [14] and other morphologies [15-24]) have been prepared via various morphology control processes with the aid of nanomaterials or special materials. Generally, it is time-consuming and expensive to prepare suitable nanomaterials or special materials for the fabrication of lotus leaf-like superhydrophobic coatings. Although new morphology control methods continue to