Development of micro- and nanostructures mimicking natural leaf surfaces for controlled hydrophilic and hydrophobic property

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Abstract

Biological systems offer unique principles for the design and fabrication of engineering platforms (i.e., popularly known as “Biomimetics”) for various applications in many fields. For example, the lotus leaves exhibit unique surfaces consisting of evenly distributed micro and nanostructures. These unique surfaces of lotus leaves have the ability of superhydrophobic property to avoid getting wet by the surrounding water (i.e., Lotus effect). Inspired by the surface topographies of lotus leaves, the artificial superhydrophobic surfaces were developed using various micro- and nanoengineering. Here, we propose new platforms that can control hydrophilic and hydrophobic property of surfaces by mimicking micro- and nanosurfaces of various natural leaves such as common camellia, hosta plantaginea, and lotus. Using capillary force lithography technology and polymers in combination with biomimetic design principle, the unique micro- and nanostructures mimicking natural surfaces of common camellia, hosta plantaginea, and lotus were designed and fabricated. We also demonstrated that the replicated polymeric surfaces had different hydrophilic and hydrophobic properties according to the mimicking the natural leaf surfaces, which could be used as a simple, but powerful methodology for design and fabrication of controlled hydrophilic and hydrophobic platforms for various applications in the field of agriculture and biological engineering.

Keywords

biomimetics, hydrophobic, hydrophilic, natural leaf, nanoengineering

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