

光照射により可逆的に生成する超撥水性表面と 超親水性表面

Reversible Formation of Superhydrophobic and Superhydrophilic Surfaces by Photoirradiation

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Abstract

Photoresponsive microcrystalline surfaces mimicking biofunctions were prepared using photochromic diarylethenes. Upon UV irradiation to a crystalline surface of the open-ring isomer of a diarylethene, the photogenerated closed-ring isomers are self-aggregated to form needle-shaped crystals on the surface. The rough surface shows the superhydrophobic lotus effect. In addition, we successfully obtained the surface with the rose-petal effects of wetting, the surface with the anti-reflective moth-eye effect, and a double roughness structure mimicking the surface of a lotus leaf by controlling the heating procedures, UV irradiation processes, and molecular structural modification. For the fabrication of a rough surface showing moth eye effect, the standing needle-shaped crystal of the closed-ring isomer grew at a much lower temperature than the eutectic temperature due to the epitaxial growth of a crystal lattice of the closed-ring isomer on a plane of the crystal lattice of the open-ring isomer in the subphase. The phenomenon may be called self-epitaxial crystal growth. By changing the molecular structure, a superhydrophilic surface mimicking a snail shell is photogenerated. These photoresponsive functions are unique, and they demonstrate a macroscopic response by assembling microscopic molecules upon light irradiation. In the future, such a molecular assembly system will be a promising candidate for fabricating photoresponsive architectures and soft robots.

キーワード：超撥水性、超親水性、光誘起表面形状変化、フォトクロミック結晶、ジアリールエテン

Keywords : Superhydrophobicity, Superhydrophilicity, Photoinduced topographical change, Photochromic crystal, Diarylethene

光照射により可逆的に色の異なる別の化合物に化けるフォトクロミック化合物を使って、結

晶成長を引き起こし生物の表面に類似した微結晶表面を作成したところ、その生物と同じ濡れ性を発現することができた。それらの表面とは、超撥水性を示すハスの葉や、超親水性を示すカタツムリの殻である。これらの表面は、鋳型を使うことなく生成するばかりか、別の波長の光を照射すると元の平滑な表面に戻り、最初

2018年8月28日受付

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