
Formation of Hierarchical Nanoporous Layer on glass of various compositions

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Abstract

Hierarchical Nanoporous Layer (HNL) glass that has nanoscale pores on its surface was developed in recent years. The HNL exhibit a long-life superhydrophilicity and an optical anti-reflection property. That is, the HNL glass maintains the water contact angle less than 10 degree for more than several months and has a very low optical reflectivity around 0.5% at a wide wavelength (400 to 900 nm).

The pores in the HNL gradually changes its size as a function of depth from apparent surface. The HNL is easily formed by alkaline etching treatment of a glass and its thickness can be controlled by the etching conditions. However, the mechanism of HNL formation on glass is still unelucidated. It is inferred that it becomes possible to control the formation and structure of the HNL by clarifying the mechanism.

In this work, we investigated the formability of HNL on various kinds of glass like soda-lime, borosilicate, aluminosilicate and so on by conducting SEM micrography, XPS and so on with changing the glass and etching conditions. The forming speed and the formed structure varied in accordance with the glass composition. We will discuss the HNL forming mechanism from the viewpoint of the composition dependence.

Keywords: antireflectivity, superhydrophilicity, nanoporous, etching

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