
Formation of Hierarchical Nanoporous Layer etched on a silicate glass

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Abstract

Hierarchically porous materials, with pores of which size changes under certain regularity, are gathering much attention because of its various functionalities. A drug container in a drug delivery system (DDS), metal adsorbent from polluted water and so on. are expectedly realized by the structures. Silica-based materials with such a hierarchical porous structure have reportedly been fabricated by using particular templates so far.

We have developed a new hierarchically nanoporous layer (HNL) formed on a silicate glass surface by a simple etching process in an alkaline solution.[1] A three-dimensionally continuous porous structure like a sponge was clearly observed by SEM micrography. The porous size gradually decreases from the apparent surface to the interface of the porous layer and bulk substrate. That is, a hierarchically porous structure was spontaneously formed by the simple etching process other than previously developed ones by template methods. The temperature and time dependence of the HNL formation indicated some activation energy for this phenomenon.

The HNL glasses exhibits lower optical reflectivity all over the visible light range than untreated glass and super-hydrophilic property that remains its water contact angle around 5 degree for more than 100 days. The long-life superhydrophilicity realizes practically useful anti-fouling and anti-fogging functionalities. We will discuss the properties and mechanism of the functionalities.

1T. Fujima, E. Futakuchi, T. Tomita, Y. Orai and T. Sunaoshi, *Langmuir* 30 (2014), 14494.

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