UE01

Nanostructured SiC-based Ceramic Filmsfrom Self-assembly Inorganic-Organic Diblock Copolymer

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The oriented nanostructures from block copolymers have great interests because of their numerous potential applications in optoelectronics, sensors, nanogenerator, and electronic circuits. The microdomains of block copolymers could be aligned by applying the external fields such as shear, electric force to overcome interfacial interactions. In this study, highly oriented SiCN nanostructured films have been successfully fabricated by using self-assembled poly(vinyl)silazane-*block*-polystyrene (PVSZ-*b*-PS) diblock copolymer with no electric filed, and followed by annealing up to 900°C under Ar atmosphere. Their nanostructured films were characterized by atomic force microscopy (AFM), field emission scanning electro microscopy (HR-SEM) and X-ray diffraction (XRD). The results revealed that the well-ordered nanotublar ceramic film of 35~50 nm thick was readily obtained with all parallel channel of 10 ± 2 nm diameter and the 5 ± 1 nm wall thickness, perpendicular to the substrate surface. Moreover, the ratio of both blocks was controlled to form the nanopillar structures as a reversed structure of cylindrical morphology, which was expected by phase diagram. The nanopillar films consisted of amorphous SiCN ceramic with ~10 nm diameters and ~500 nm long, which have an area density of approximately 3.1×10^{11} pillars per square centimeter. The pillars are parallel to each other, uniformly distributed, highly oriented. These exciting results have a great potential to open a new field for the generation of mesostructured non-oxide ceramic or metal-ceramic materials for a broad class of applications.

REFERENCES

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UE02

Pervaporation Characteristics of Hydrophilic Zeolite Membrane for IPA/water Separation

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The hydrophilic zeolite membranes were synthesized on the inside surface of a porous α-alumina support from the reaction solution composed of Si : Al : Na : water molecules. The pervaporation performance of the synthesized hydrophilic zeolite membrane was investigated for the aqueous iso-propyl alcohol(IPA) solution with respect to the different feed concentration and the different operating temperature. The total flux decreases by increasing the feed IPA concentration and increases by increasing the temperature. The separation performance of water through the NaY membrane was moderate compared to that of the NaA membrane. Pore size of NaA zeolite membrane has 0.42 nm and NaY zeolite membrane has 0.74 nm. The synthesized NaA and NaY zeolite crystals were randomly grown to the size of 1~2 μm with a zeolite layer thickness of 5 μm.

NaA and NaY zeolite membranes were successfully synthesized on the inner surface of a porous-alumina supports and it was shown that water could be excellently separated from IPA/water mixtures by the pervaporation using either the NaA or the NaY zeolite membrane. The flux and the separation factor through NaA and NaY zeolite membranes were strongly affected by both the feed concentration and the operating temperature. The separation factors by the NaA zeolite membrane were higher than 1,000. On the other hand, the NaY zeolite membrane showed the high separation factors no less than 20,000 for all experimental conditions. The water flux through the NaY zeolite membrane was 2~2.8 times higher than that of the NaA zeolite membrane depending on the operating condition. In this study, a thin film of either the NaA or the NaY zeolite was prepared by growing crystals on the inside of a support and used as a water selective membrane to separate water from an aqueous feed solution containing IPA. The separation characteristics were investigated and compared through both the NaA and the NaY zeolite membrane. In particular, the effect of a temperature on the IPA/water separation was intensively investigated.