nterface Engineering of Hierarchical BN Nanostructure Films

Amir Pakdel
Tomonobu Nakayama, Yoshio Bando, Dmitri Golberg
World Premier International Center for Materials Nanoarchitectonics (WPI-MANA)
National Institute for Materials Science (NIMS), Japan
PAKDEL.Amir@nims.go.jp

Continuous progress in nanofabrication methods have led to better understanding of physics and chemistry of liquid/solid and liquid/gas interfaces at low-dimensional materials and brought the advent of a new area of nanoscale interface engineering. The main goal of this new field is to employ nano- and microscale interfacial features to obtain materials with radically new and previously unattainable properties. A classical example of interface-related properties is the wettability of materials, where the interfacial interactions between their surfaces and water determine the wetting degree.

Low-dimensional BN materials are among the most promising inorganic nanosystems explored so far due to their unique properties, such as electrical insulation, wide optical bandgap, deep UV emission, good thermal conductivity, excellent stiffness, and outstanding thermal stability.[1] In this study BN-based hierarchical nanostructure films, in particular vertically aligned and randomly distributed nanotubes and nanosheet films, were grown on Si/SiO_2 substrates by a thermal CVD method and were employed as a platform to study the influence of surface nanomorphology on the static and dynamic interaction of BN with water.[2-4] Moreover, chemical functionalization of BN nanosheets, as another aspect of nanoscale interface engineering, was achieved by air plasma and ultraviolet (UV)/ ozone treatments and wet chemistry. As a result, a wide range of wetting properties from superhydrophilicity with water contact angle (CA) of ~5° to superhydrophobicity with water CAs of ~160° was obtained by changing the surface nanomorphology or chemical composition.

References

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Figures

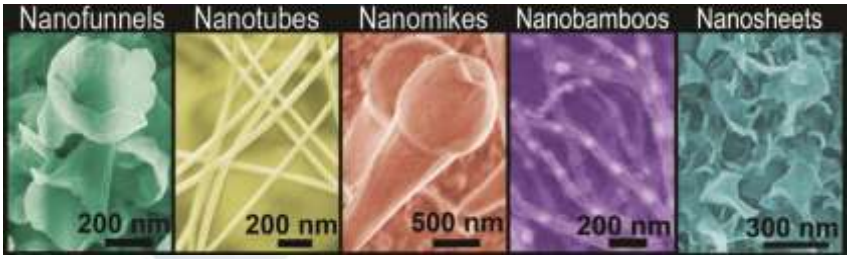

Figure 1. Examples of hierarchical BN nanostructures synthesized by our CVD method.