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PII: S0925-8388(14)01268-7
DOI: http://dx.doi.org/10.1016/j.jallcom.2014.05.161
Reference: JALCOM 31350

To appear in:

Received Date: 15 April 2014
Revised Date: 19 May 2014
Accepted Date: 24 May 2014

Please cite this article as: N. Zhang, H. Liu, H. Kan, X. Wang, H. Long, Y. Zhou, The preparation of high-adsorption, spherical, hexagonal boron nitride by template method, (2014), doi: http://dx.doi.org/10.1016/j.jallcom.2014.05.161

# The preparation of high-adsorption, spherical, hexagonal boron nitride by template method

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**Abstract**

This research used low-cost boric acid and borax as a source of boron, urea as a nitrogen source, dodecyl-trimethyl ammonium chloride (DTAC) as a template, and thus prepared different micro-morphology hexagonal boron nitride powders under a flowing ammonia atmosphere at different nitriding temperatures. The effects of the template content and nitriding temperature on the micro-morphology of hexagonal boron nitride were studied and the formation mechanism analysed. The influences of the template content and nitriding temperature on adsorption performance were also explored. The results showed that at a nitriding temperature of 675 °C, the micro-morphologies of h-BN powder were orderly, inhomogeneous spherical, uniform spherical, beam, and pie-like with increasing template content. The micro-morphology was inhomogeneous spherical at a DTAC dose of 7.5 %. The micro-morphology was uniform spherical at a DTAC dose of 10 %. At a DTAC dose of 12 %, the micro-morphology was a mixture of beam and pie-like shapes. At a certain template content (DTAC at 10 %) and at lower nitriding temperatures (625 °C and 650 °C), spherical shell structures with surface subsidence began to form. The porous spheres would appear at a nitriding temperature of 675 °C, and the ball diameter thus formed was approximately 500 to 600 nm. The ball diameter was about 600 to 700 nm when the nitriding temperature was 700 °C. At a nitriding temperature of 725 °C, the ball diameter was between 800 and 1000 nm and sintering necking started to form. When the relative pressure was higher, previously closed pores opened and connected with the outside world: the adsorption then increased significantly. The adsorption increased gradually with increased nitriding temperature, and the adsorption was maximised at 276.02 $cm^3/g$ under nitrogen at 675 °C. The adsorption decreased when the nitriding temperature continued to increase to between 700 °C and 725 °C).

**Keywords**：hexagonal boron nitride; template; adsorption property; nitriding temperature

## 1. Introduction

Boron nitride (BN) is a typical III-V compound and a non-metal, oxide ceramic material. Its crystal structure is similar to that of carbon [1-3] and mainly contains four types of isomers which are respectively: hexagonal boron nitride (h-BN), trigonal boron nitride (r-BN), cubic boron nitride(c-BN), and wurtzite boron nitride (w-BN)[4]. The h-BN has excellent heat resistance, good corrosion resistance, a lower thermal expansion coefficient, high thermal conductivity, a low density, excellent lubricity, chemical stability, etc [5-7]. It also has high filling ability. It has great application potential in the field of LED as the filling material of heat-conducting plastic, so the significance of the study is great. In addition, it has higher

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