The fabrication and properties of nanocone arrays on diamond surface

<u>Changzhi Gu</u>

Beijing National Laboratory of Condensed Matter, Institute of Physics Chinese Academy of Sciences, Beijing 100080, China

Email: czgu@iphy.ac.cn

Due to the high aspect ratio and stable mechanical properties, the conical surface nanostructures show wide potentials in many application fields such as optics, electronics, thermology and biology. However, the complicate fabrication processes combined lithography and etching are not good enough to meet specific requirements for applications [1].

In this work, we developed a bias-assisted plasma etching technology for fabricating nanocone arrays on the surface of diamond films without mask. During the fabrication process of nanocone arrays, the mixtures of CH_4 and H_2 were used as etching gases, an negative bias voltage of about -300V was applied to form plasma, and the temperature of diamond film substrate is about 800-1000°C. The asformed diamond nanocone arrays show many advantages such as large area, uniform orientation and controllable density as shown in Fig.1. We suggested that the self-organized selective sputtering effect of methylic ions play key roles for the formation of nanocones. The field electron emission, electron transport, gas sensitivity and other unique properties from the diamond nanocones are studied [2].



Fig.1 Diamod nanocone arrays etched by ion beam without mask

Acknowledgements

this work was supported by the National Natural Science Foundation of China under Grant Nos. 61888102, 11974386, 62174179, 12074420, U21A20140 and 61905274, the National Key Research and Development Program of China under Grant No. 2021YFA1400700.

References

[1] A. J. Cui, et al., Scientific Reports, **2**,2429(2013)

[2] P. Xu, et al., Nature Nanotechnology, 2,97(2008).