

# Response letter

Dear Reviewers

First of all, we would like to express our great thanks to you for your carefully reading our manuscript and providing us very helpful suggestions. We appreciate your comments very much.

According to your requirements and suggestions, we have carefully answered the questions mentioned by reviewers, and revised the manuscript in red color.

We would like to resubmit the revised manuscript to *Materials*. Thank you for your consideration and time.

Best regards,

Genqiang Chen

## Reviewer 2

**1. The language in the introduction is sometimes vague: "It is gratifying that diamond heteroepitaxy on Ir has achieved some excellent results" - It is not clear what is meant by excellent results. When say "China has achieved excellent results".**

**The same applies to the sentence: "The performance of MOSFET with the same size is much better than that we reported previously". It is not clear what is meant by "the performance".**

We are very grateful to your comments for the manuscript.

We revised the sentences, *page 1 line 45*, "It is gratifying that diamond heteroepitaxy on Ir has achieved some excellent results" to "*It is gratifying that diamond heteroepitaxy on Ir has been greatly developed. Not only the size 4-inch of heteroepitaxial diamond but also the low dislocation density of  $9 \times 10^6 \text{ cm}^{-2}$  were achieved.*" And, this sentence, *page 2 line 54*, "The performance of MOSFET with the same size is much better than that we reported previously" was modified to be "*The output current density IDS, maximum transconductance gm(max) and carrier density of MOSFET with a same size is much better than that we reported previously.*" The two were revised using red font in the revised manuscript.

**2. Materials and methods sections start with the results of XRD (first sentence) obtained by characterization of the diamond sample, and photographs of the diamond sample (second sentence). The description of sample preparation is after the results.**

**I recommend following chronological order - first to write how was the sample preparation and after that how it was characterized. Otherwise, it is confusing for readers.**

Thanks for your generous comments. We re-wrote this part following chronological, and supplied several sentences to describe the heteroepitaxial diamond preparation. This part "Fig.1 (a) shows the the XRD (X-ray diffraction) characteristic of the HSCD. The FWHM of (004) X-ray rocking curve was measured as 209.52 arcsec. The insert image is the optical image of heteroepitaxy heteroepitaxial diamond with a dimension of 26×26×1 mm<sup>3</sup>" was revised to be "*In this work, an a-plane (11-20) sapphire with a size of 26×26×1 mm<sup>3</sup> was chosen as substrate. Then, approximately 150 nm Ir was deposited at 900 °C using magnetron sputtering technology. Subsequently, bias enhanced nucleation was conducted in direct current CVD. After BEN process, diamond epitaxy was carried out in MPCVD for 100 h with a growth rate of 10 μm/h. The specific parameters of BEN and epitaxial growth process were reported elsewhere [17]. The insert image is the optical image of polished heteroepitaxial diamond with a dimension of 26×26×1 mm<sup>3</sup>. Fig.1 (a) shows the XRD (X-ray diffraction) characteristic of the HSCD. The FWHM of (004) X-ray rocking curve was measured as 209.52 arcsec.*"

**3. The substrate for diamond growth is not specified.**

Thanks for your reminding. The substrate for diamond growth is a-plane (11-20) sapphire, and it was added in the part of *Materials and methods* part.

**4. Type of MPCVD system is not mentioned.**

Thanks for your comment. The type of MPCVD we used is horizontal type MPCVD with a maximum microwave power 6 kW. And a sentence “After BEN process, diamond epitaxy was carried out in horizontal type MPCVD for 100 h with a growth rate of 10  $\mu\text{m/h}$ ” was added in revised manuscript.

**5.The conclusion states "The annealing condition for Al<sub>2</sub>O<sub>3</sub>/H-diamond need to be controlled precisely." It is not clear what is meant by precise control.**

Thanks for your suggestion. The “annealing condition” was replaced by “annealing temperature and period” in the revised manuscript.