

Dear Referee,

We would like to submit a manuscript, "**Ultrafast Transient Absorption Measurements of Photocarrier Dynamics in PdSe<sub>2</sub>**", for your kind consideration.

In this manuscript, we report the dynamical properties of photocarriers in PdSe<sub>2</sub> layered crystals using transient absorption microscopy. Since 2004, the successful preparation of graphene has aroused great interest in two-dimensional layered materials. In particular, layered transition metal dichalcogenides (TMDCs), such as MoS<sub>2</sub>, with excellent charge transport and thermoelectric properties, layer-dependent electronic band structures, and good air stability have received extensive attention from researchers over the past decade. However, their bandgap range in visible (1.2-1.9 eV) limits optimal use in optoelectronic devices, especially in the IR range.

Here we show that PdSe<sub>2</sub>, a narrow-bandgap layered material, possesses superior photocarrier properties. We report a photocarrier lifetime of 210 ps and a diffusion coefficient of 7.3 cm<sup>2</sup> s<sup>-1</sup>. Based on these results, we deduce a diffusion length is approximately 400 nm and the photocarrier mobility of approximately 300 cm<sup>2</sup> V<sup>-1</sup>s<sup>-1</sup>. These findings contribute to a better understanding of the optoelectronic properties of PdSe<sub>2</sub>.

We believe that the reported photocarrier dynamical properties in PdSe<sub>2</sub> are highly interesting to researchers working on nanoscale optoelectronics. Furthermore, PdSe<sub>2</sub> is a layered transition metal dichalcogenide with unique electronic and optical properties, featuring a novel pentagonal structure and many new characteristics such as high air stability and in-plane optical anisotropy. Therefore, understanding the dynamical properties of photocarriers in this new material is crucial for designing and optimizing future field-effect transistors (FETs) and optoelectronic detectors based on PdSe<sub>2</sub> and its heterostructures. We also believe that our work would stimulate more studies on the photocarriers and optical properties of this elusive material.

Thank you very much for your consideration!

Yours Sincerely,

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