

Lasing Reporting Summary

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► Experimental design

Please check: are the following details reported in the manuscript?

1. Threshold

Plots of device output power versus pump power over a wide range of values indicating a clear threshold

☒ Yes
☐ No

ig.3b in the main text shows the light-light curve in linear and log scales of a typical device indicating a clear threshold for lasing process.

2. Linewidth narrowing

Plots of spectral power density for the emission at pump powers below, around, and above the lasing threshold, indicating a clear linewidth narrowing at threshold

☒ Yes
☐ No

ig.3a show the spectrum of the device under different pump powers, which indicate a clear linewidth narrowing of the emission. Below threshold, the linewidth of the spontaneous emission is ~100 nm. Above threshold, the lasing linewidth is ~0.25 nm (Supplementary Fig. 11).

Resolution of the spectrometer used to make spectral measurements

☒ Yes
☐ No

The resolution of our spectrometer is ~0.1 nm.

3. Coherent emission

Measurements of the coherence and/or polarization of the emission

☒ Yes
☐ No

We have measured the first order of coherence which matches well with our simulated results (Fig. 3c and e, Fig. 4b, Supplementary Fig. 11). The polarization of the emission is shown in Fig. S13.

4. Beam spatial profile

Image and/or measurement of the spatial shape and profile of the emission, showing a well-defined beam above threshold

☒ Yes
☐ No

The spatial profile of the emission has been imaged, and it indicates the existence of a well-defined beam above threshold as shown in Fig.3e and 3f.

5. Operating conditions

Description of the laser and pumping conditions
Continuous-wave, pulsed, temperature of operation

☒ Yes
☐ No

Methods section and Abstract

Threshold values provided as density values (e.g. W cm⁻² or J cm⁻²) taking into account the area of the device

☒ Yes
☐ No

Main text. The threshold values are provided as a density value (kW cm⁻²) taking into the account the area of the pump laser spot.

6. Alternative explanations

Reasoning as to why alternative explanations have been ruled out as responsible for the emission characteristics
e.g. amplified spontaneous, directional scattering; modification of fluorescence spectrum by the cavity

☒ Yes
☐ No

We have ruled out alternative explanations.

7. Theoretical analysis

Theoretical analysis that ensures that the experimental values measured are realistic and reasonable
e.g. laser threshold, linewidth, cavity gain-loss, efficiency

☒ Yes
☐ No

We have calculated mode profiles of the lasing modes, which matches with the experimental ones (Fig.2e and 3f). These simulations ensure that the experimental values measured for characteristics are realistic and reasonable

8. Statistics

Number of devices fabricated and tested

☒ Yes
☐ No

Over 40 devices have been fabricated and tested.

Statistical analysis of the device performance and lifetime (time to failure)

☒ Yes
☐ No

All of them lase stably at room temperature over the tested months.