

Temperature dependent absorption spectrum of exfoliated InSe

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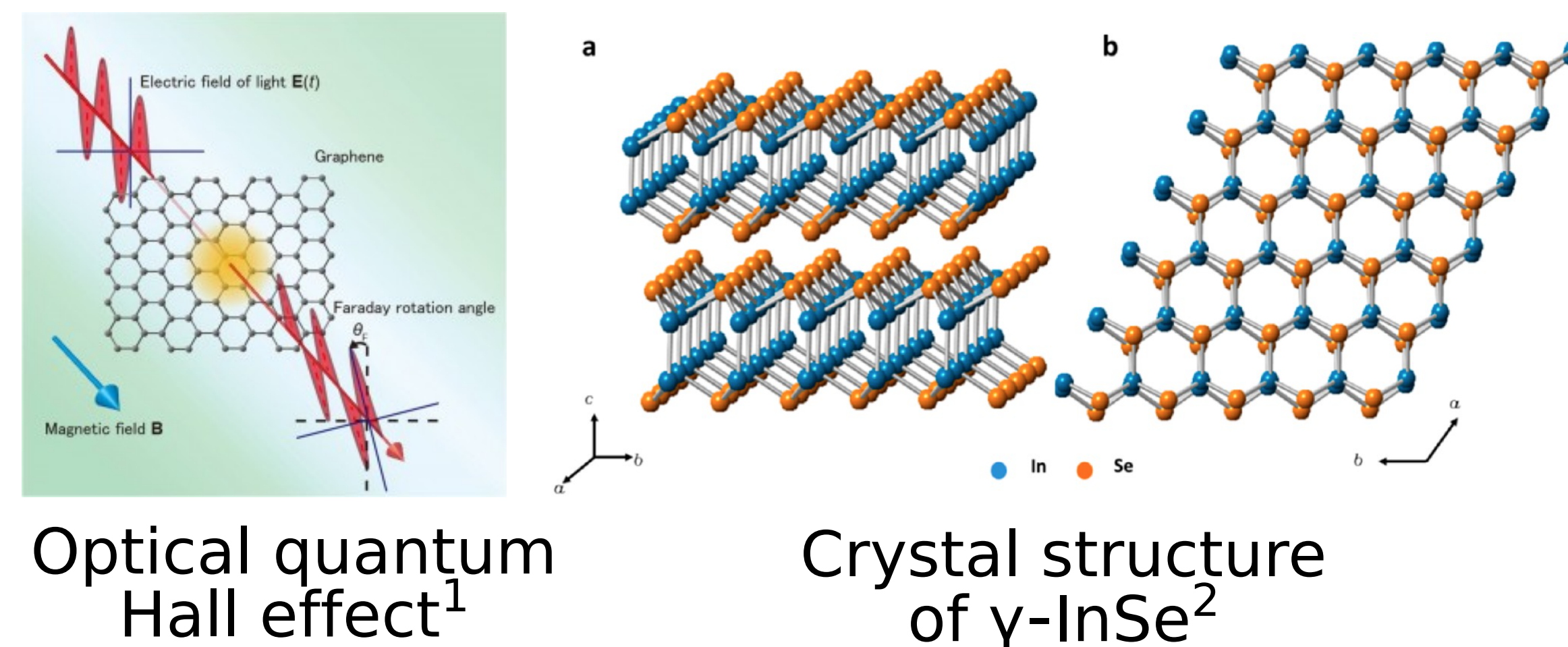
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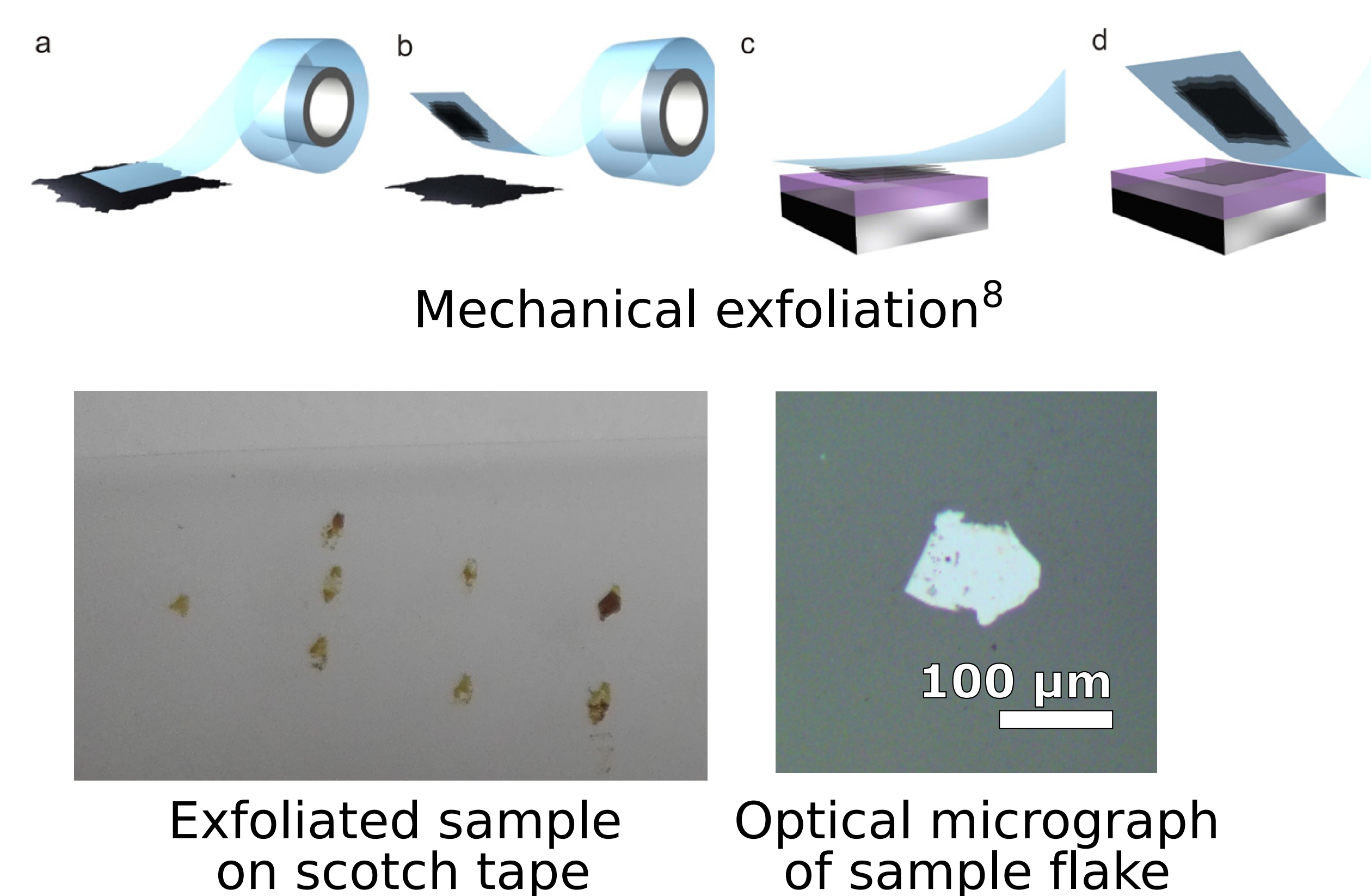
Thin layered materials

Intensive studies of thin layered materials (e.g. graphene) have revealed unexplored phenomena including quantum Hall effect.



Sample preparation

Thin flakes of InSe was made on a quartz substrate by mechanical exfoliation with scotch tape.



Experiment

Transmission spectrum was measured with changing temperature from 80 to 300 K.

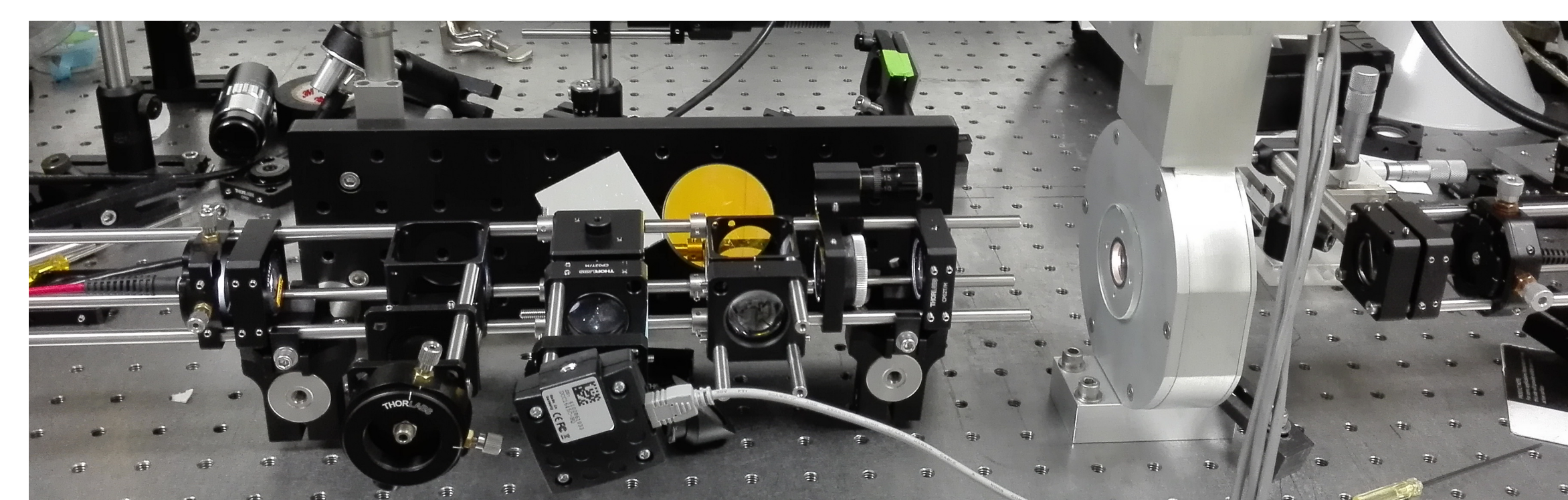
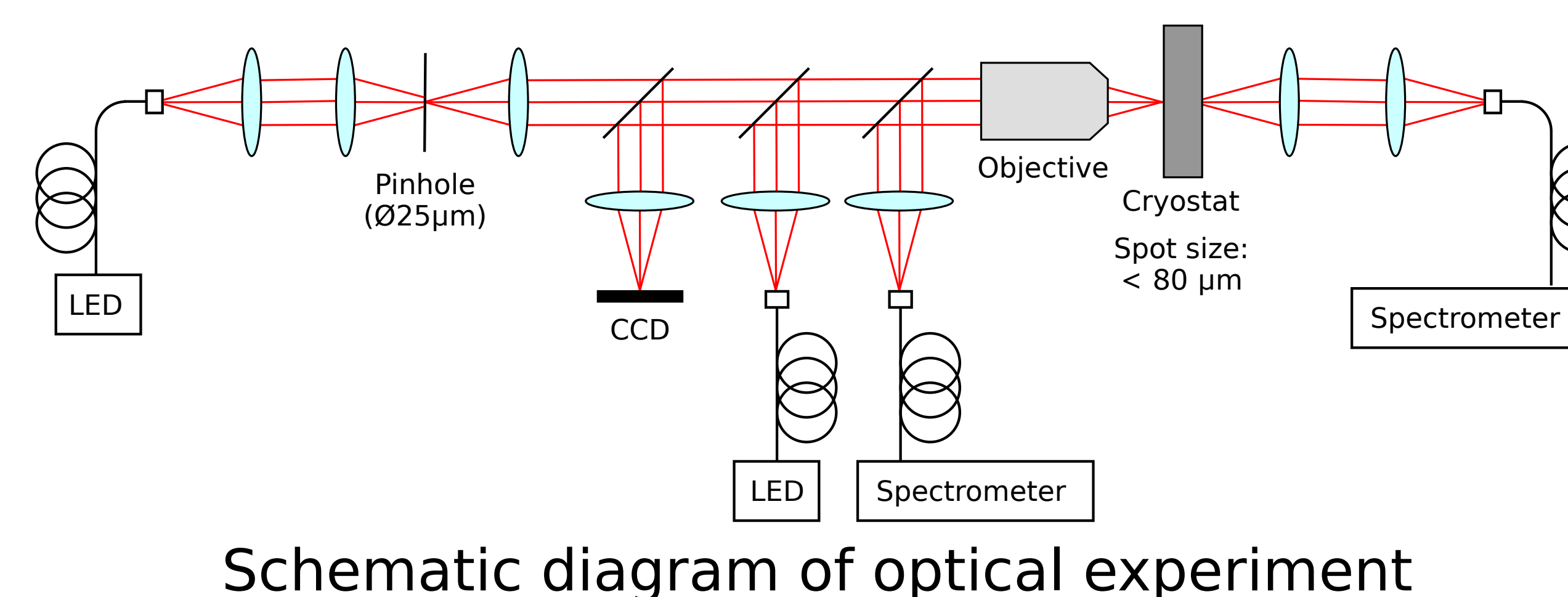
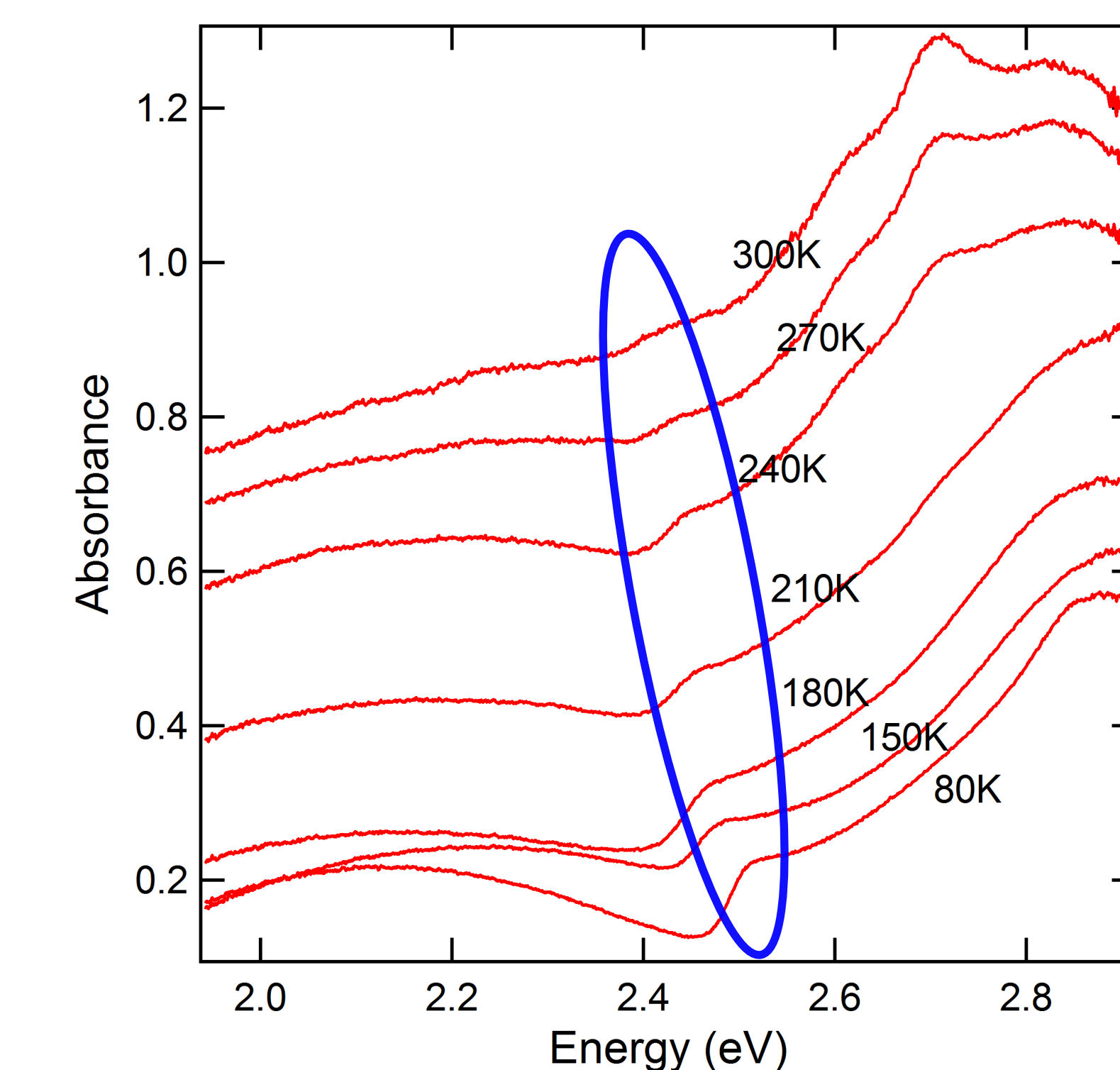
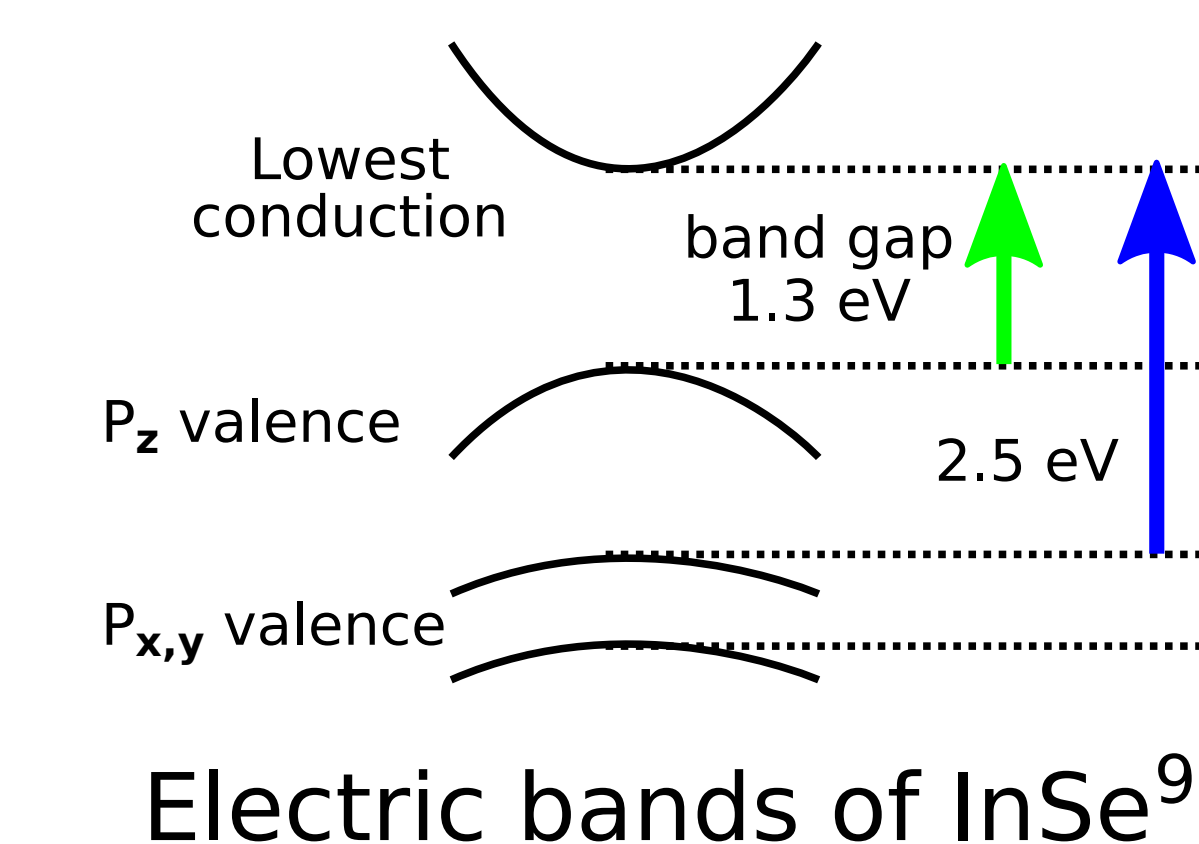


Image of setup

Result & Discussion



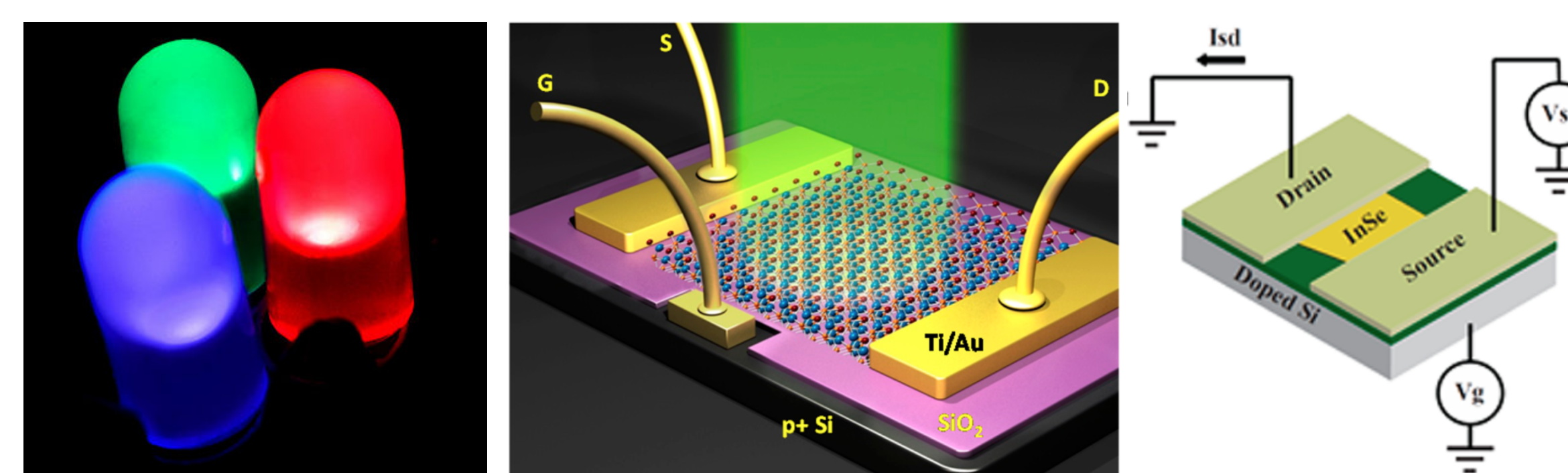
Features at 300 K around 2.5 eV became significant and shifted to higher energy as temperature decreased.



We attribute measured features to the direct transition from a $P_{x,y}$ valence band to the lowest conduction band, by observing its temperature dependence.

Indium monoselenide (InSe)

- A layered semiconductors applicable for transparent, flexible, and energy-efficient opto-electronic devices (memory³/FET⁴/detector⁵/LED/ solar cell) and thermo-electric devices⁶.
- The material properties (band structure, exciton energy) can be tuned by controlling the number of layers⁷.



Applications: LED (from wikipedia.org), memory³ and field effect transistor (FET)⁴

Objective of our work

- To control the sample thickness of InSe based on mechanical exfoliation (scotch tape method).
- To investigate optical properties of the exfoliated sample.

Conclusion

- We successfully exfoliated a thin InSe sample.
- We made an optical setup to measure transmission spectrum of a small ($\sim 80 \mu\text{m}$) flake.
- We observed the excitation from the second highest valence band to the lowest conduction band.

References

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