

# POLARITON CONDENSATES IN LATTICES

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At the frontier between non-linear optics and the physics of Bose Einstein condensation, semiconductor microcavities opened a new research field, both for fundamental studies of bosonic quantum fluids in a driven dissipative system, and for the development of new devices for all optical information processing.

Optical properties of semiconductor microcavities are governed by bosonic quasi-particles named cavity polaritons, which are light-matter mixed states. Cavity polaritons propagate like photons, but interact strongly with their environment via their matter component.

In this talk, I will review how semiconductor microcavities can be engineered into 1D and 2D lattices allowing implementing complex hamiltonians and progressing toward quantum simulation. I will show how we could generate polaritons in a 1D quasi-periodic Fibonacci potential and reveal features characteristic for a fractal energy spectrum. Then I will present a 2D honeycomb lattice for polaritons, which allows direct imaging of Dirac cones and opens the way to the investigation of the hydrodynamics of Dirac polaritons. Finally 1D lattices sustaining a non-dispersive band or “flat band” will be presented: condensation in localized plaquette states is evidenced with very short extension of the spatial coherence.

All these examples highlight the great potential of semiconductor cavities as a new platform to investigate the physics of interacting bosons.

## References

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