

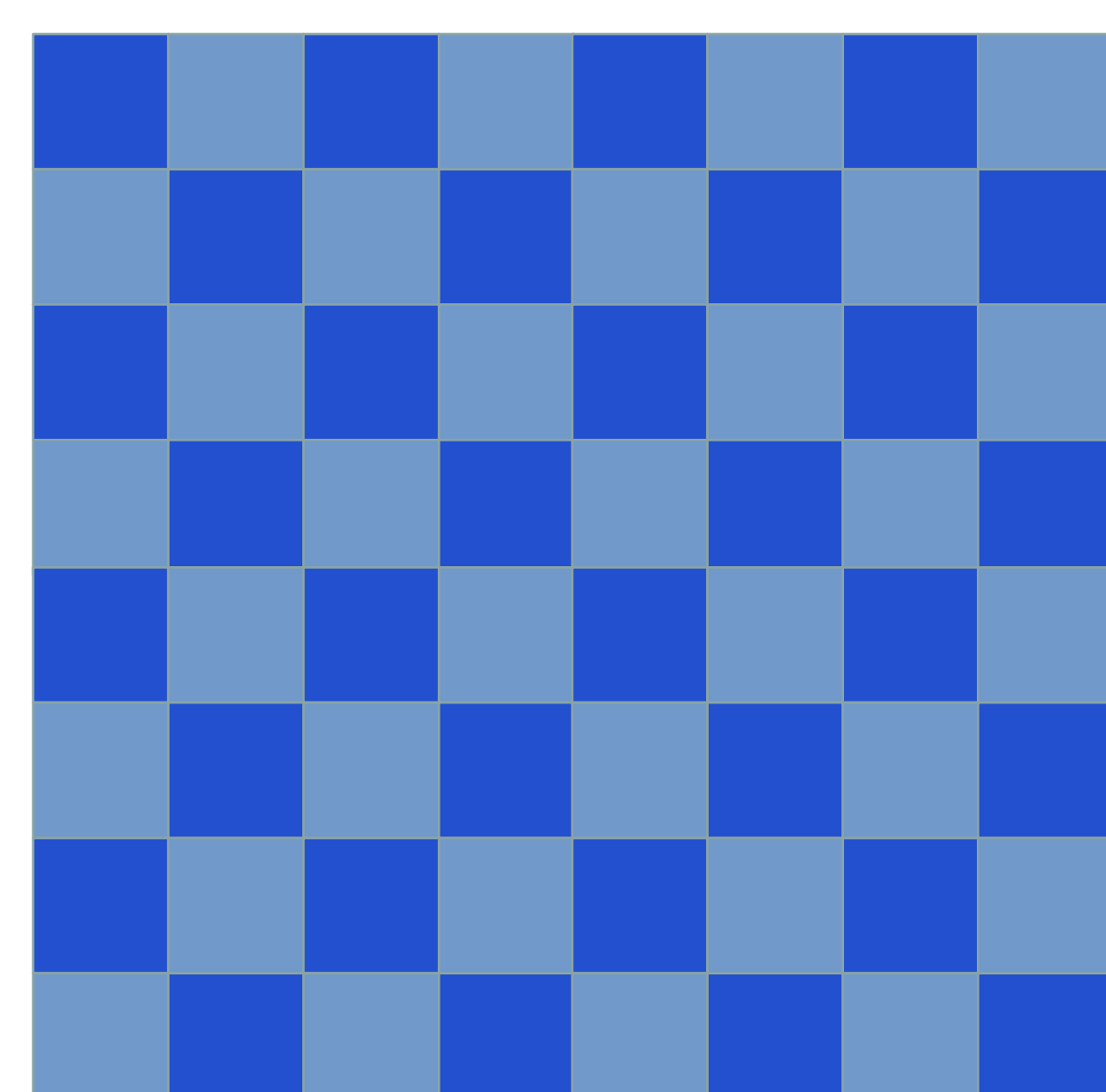
Capillary Flow Guided Assembly of Microbeads for Quasiperiodic Stacking

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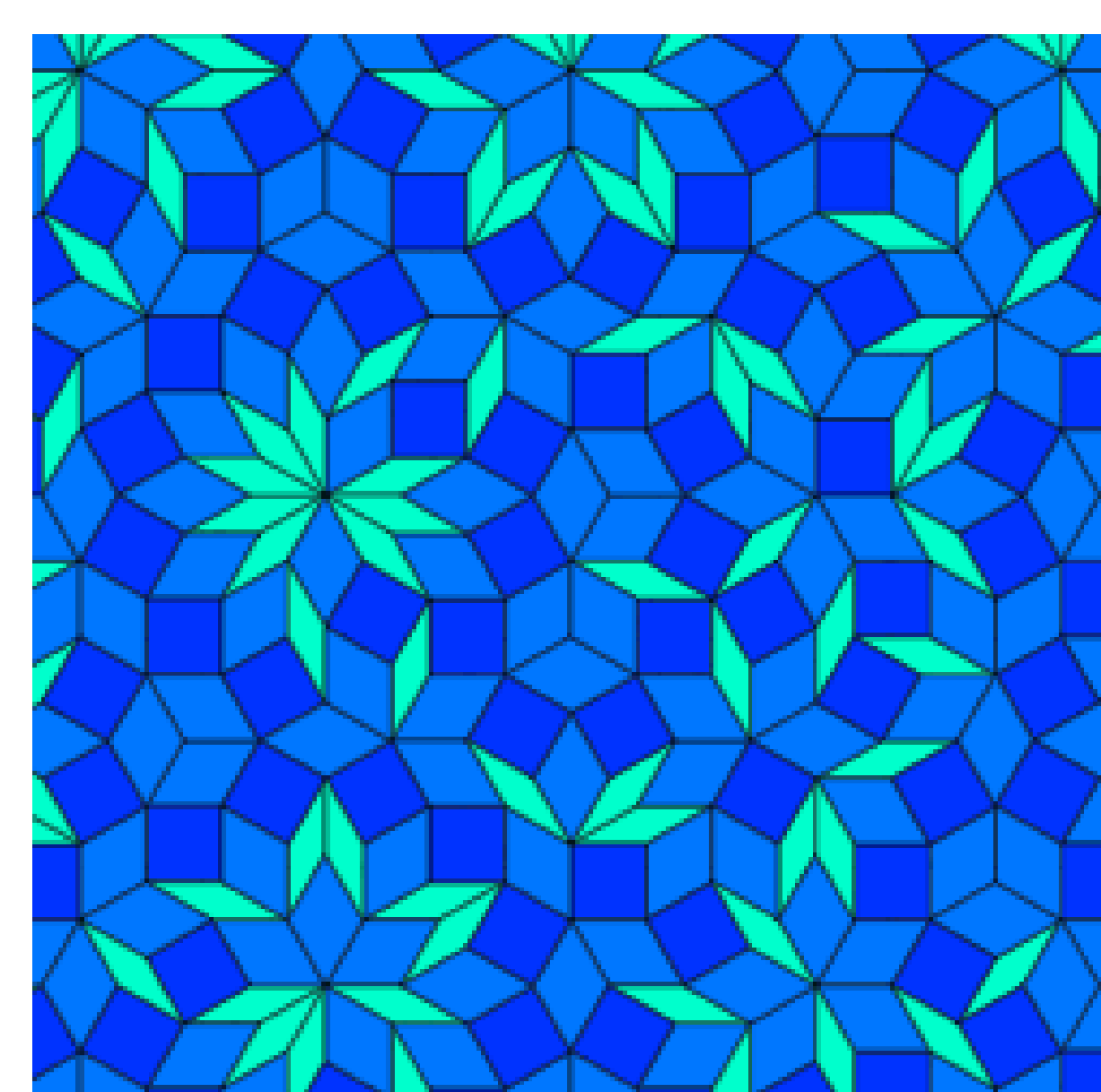
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Quasiperiodic Features



➤ Periodic tiling

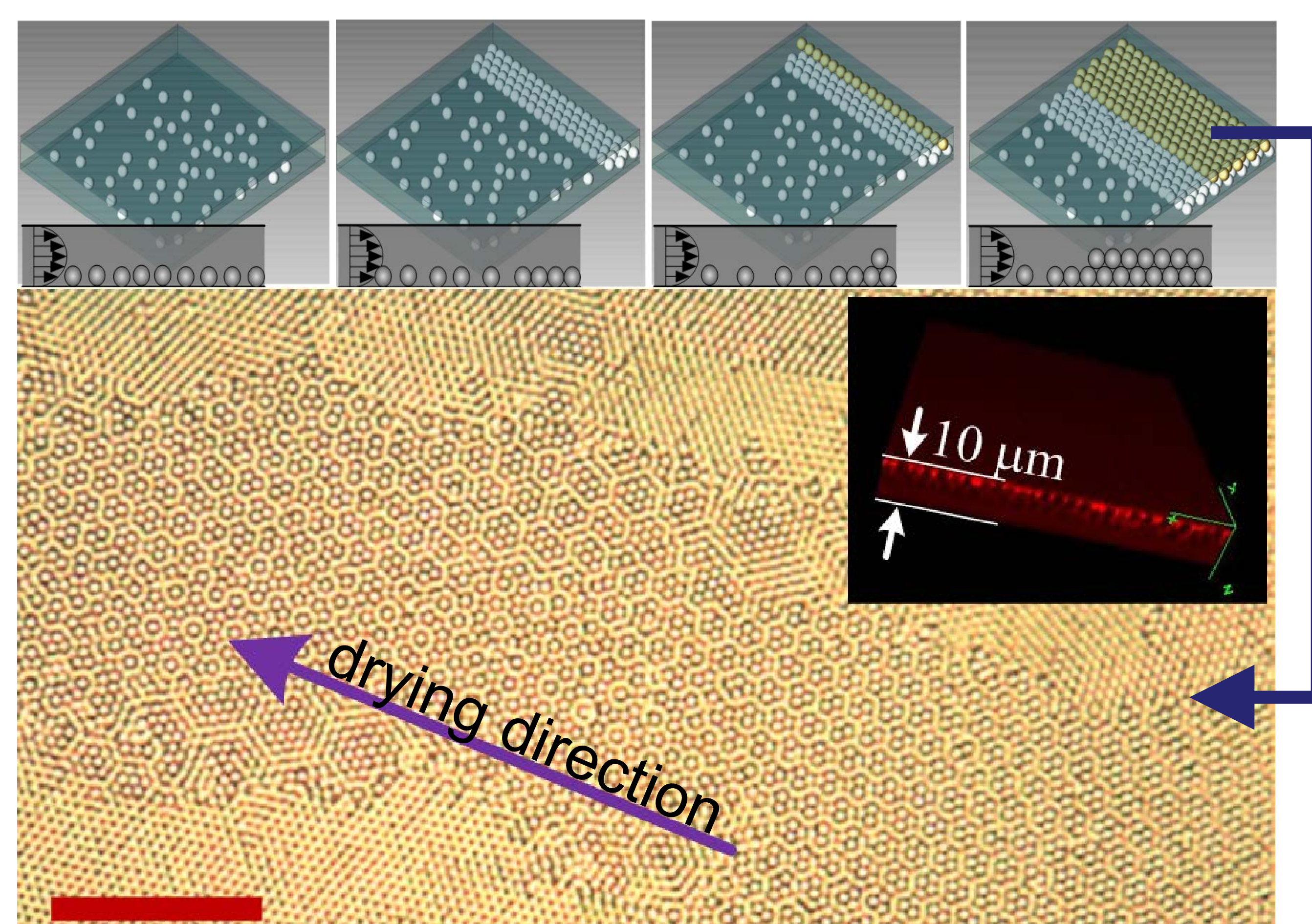


➤ Quasiperiodic tiling

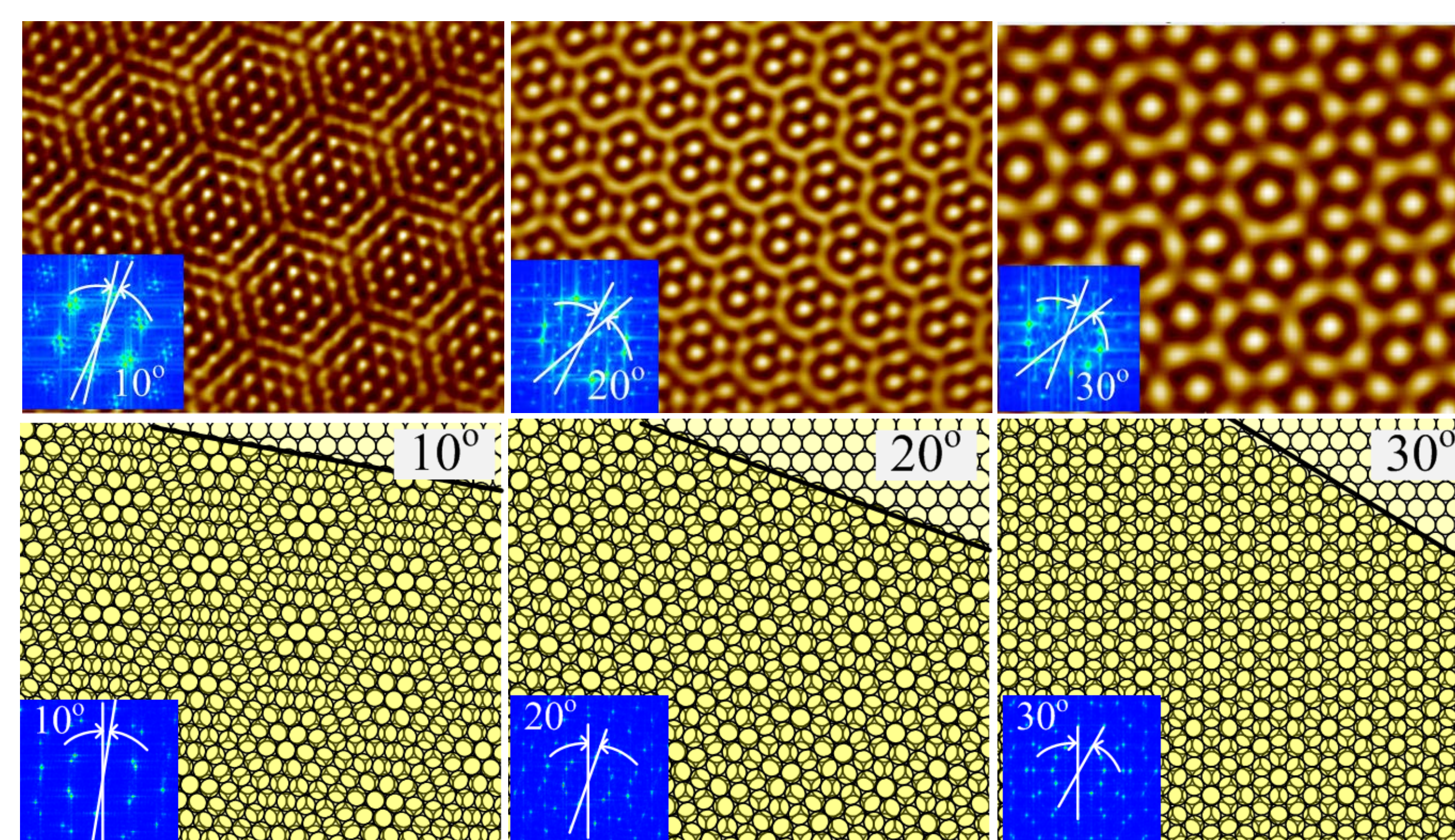
Objectives

- Develop a simple process to manufacture rarely seen but powerful quasiperiodic stacking;
- Understand the stacking mechanism;
- Reveal properties resulting from a quasiperiodic stacking.

Manufacturing Process

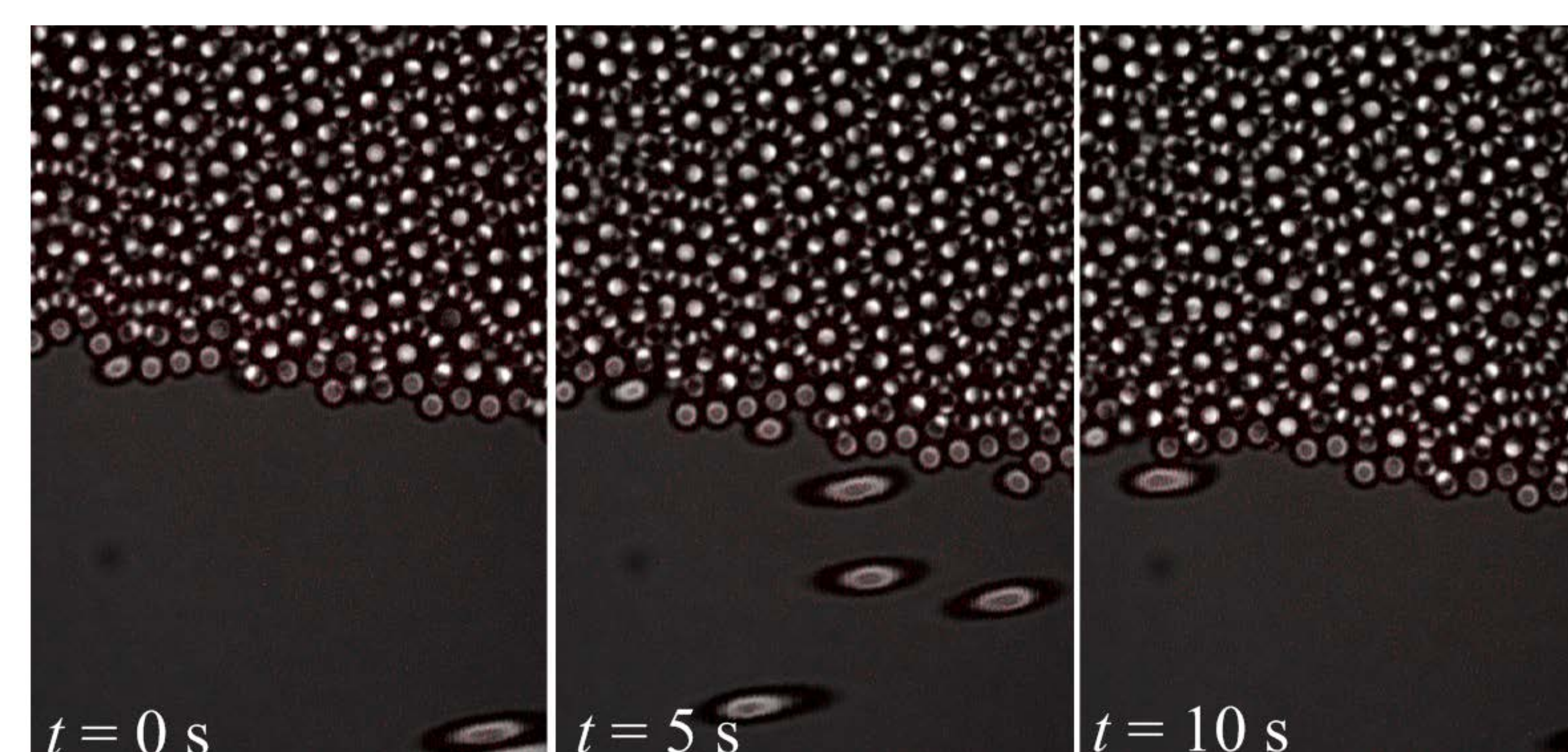


- Experimental setup and sequenced growth of a dual-layer stacking by regulating a capillary flow;
- Quasiperiodic pattern forms due to the co-existence of viscous force and gravity.

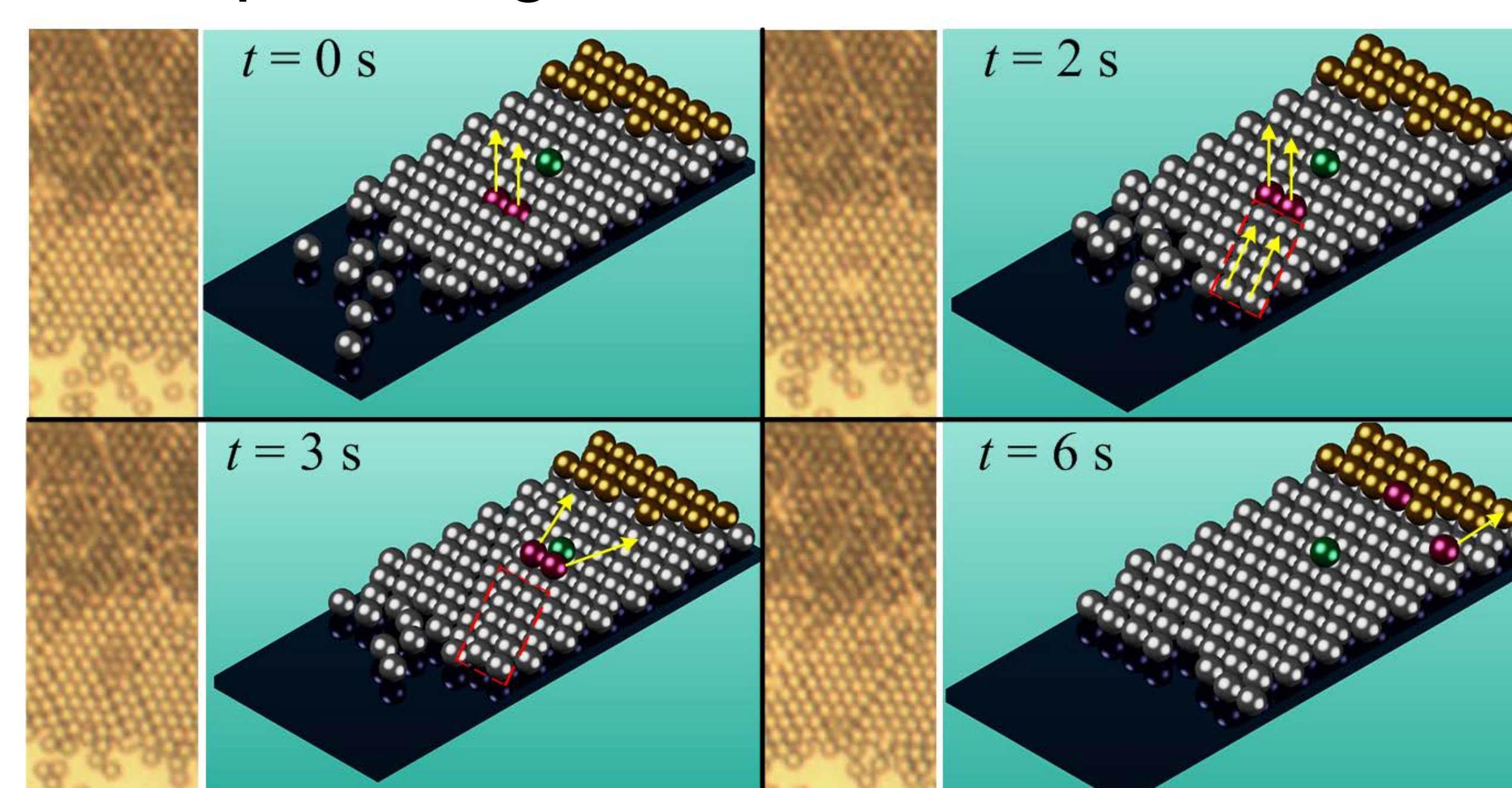


- Moiré feature-like optical contrast observed;
- Fast Fourier Transformation show relative rotations at 10, 20 and 30°, respectively.

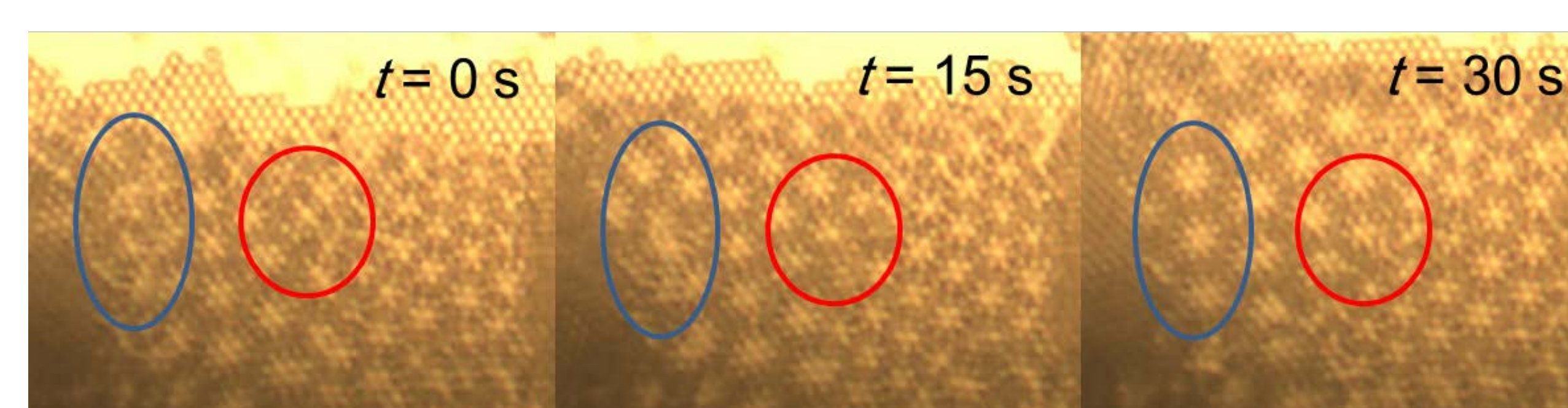
Dynamic Growth



- Sequential growth in real-time.

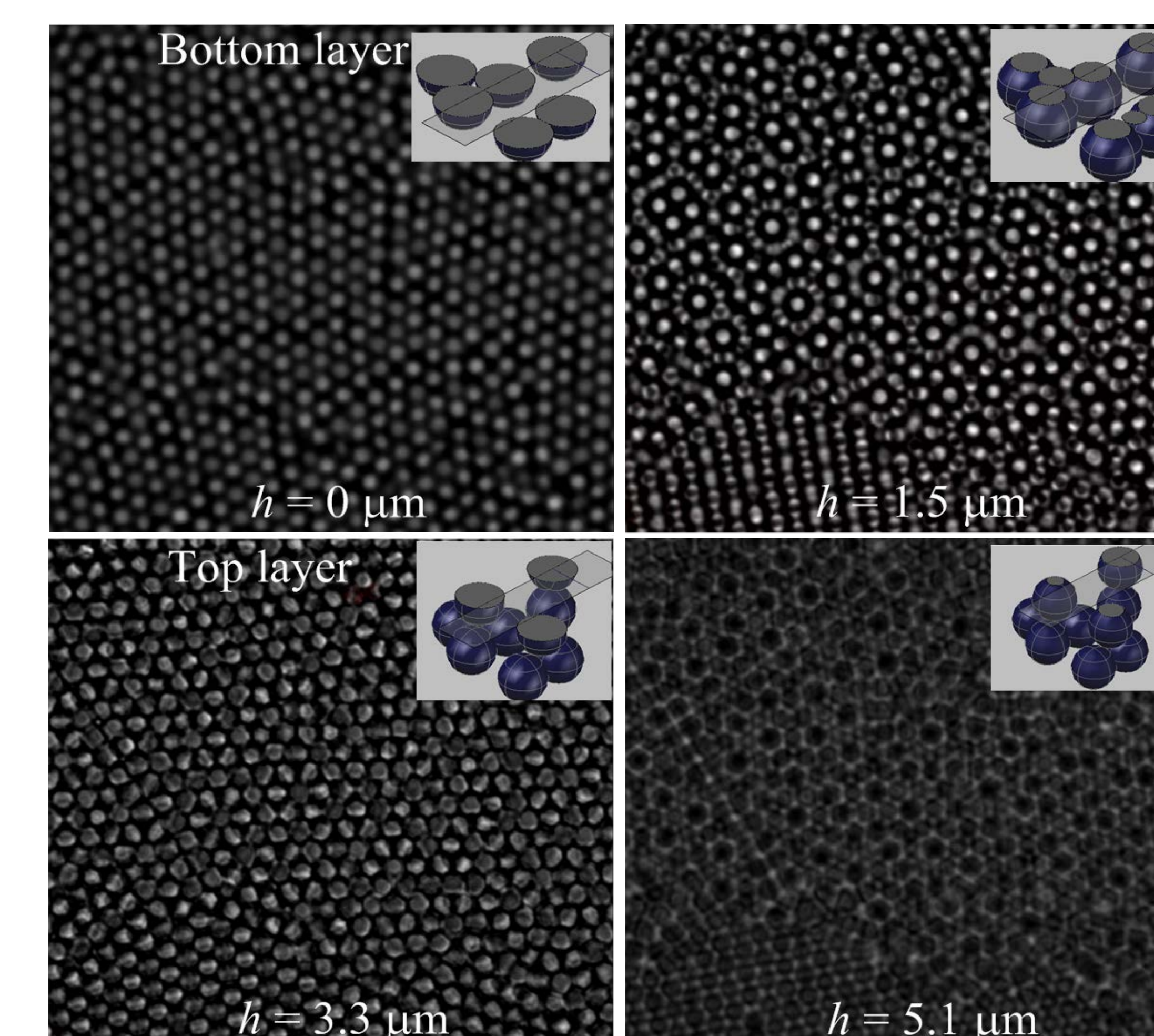


- Monolayer growth limited by buckling.

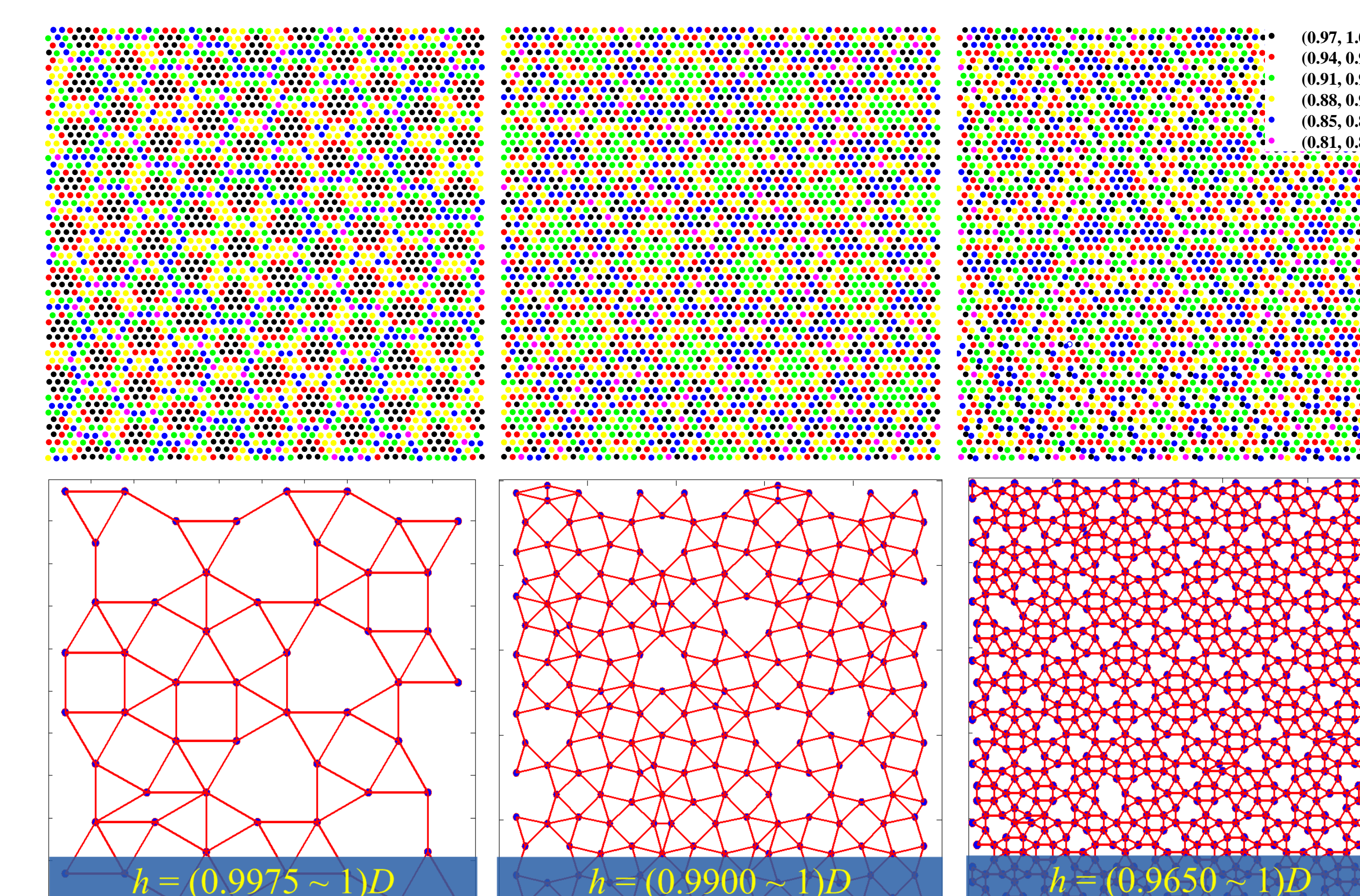


- Manufacturing defects get self-repaired.

Hierarchical Stacking



- Confocal microscopy reveals detailed stacking.



- Dodecagonally packed features plotted based on height;
- Extensive hierarchy revealed.

Conclusions

- Quasiperiodic stacking of microbeads obtained without using any templates;
- Dynamic stacking driven by gravity and capillary flow induced viscous force;
- Confocal microscopy and modeling suggest extensive hierarchy in dodecagonal packed structures.