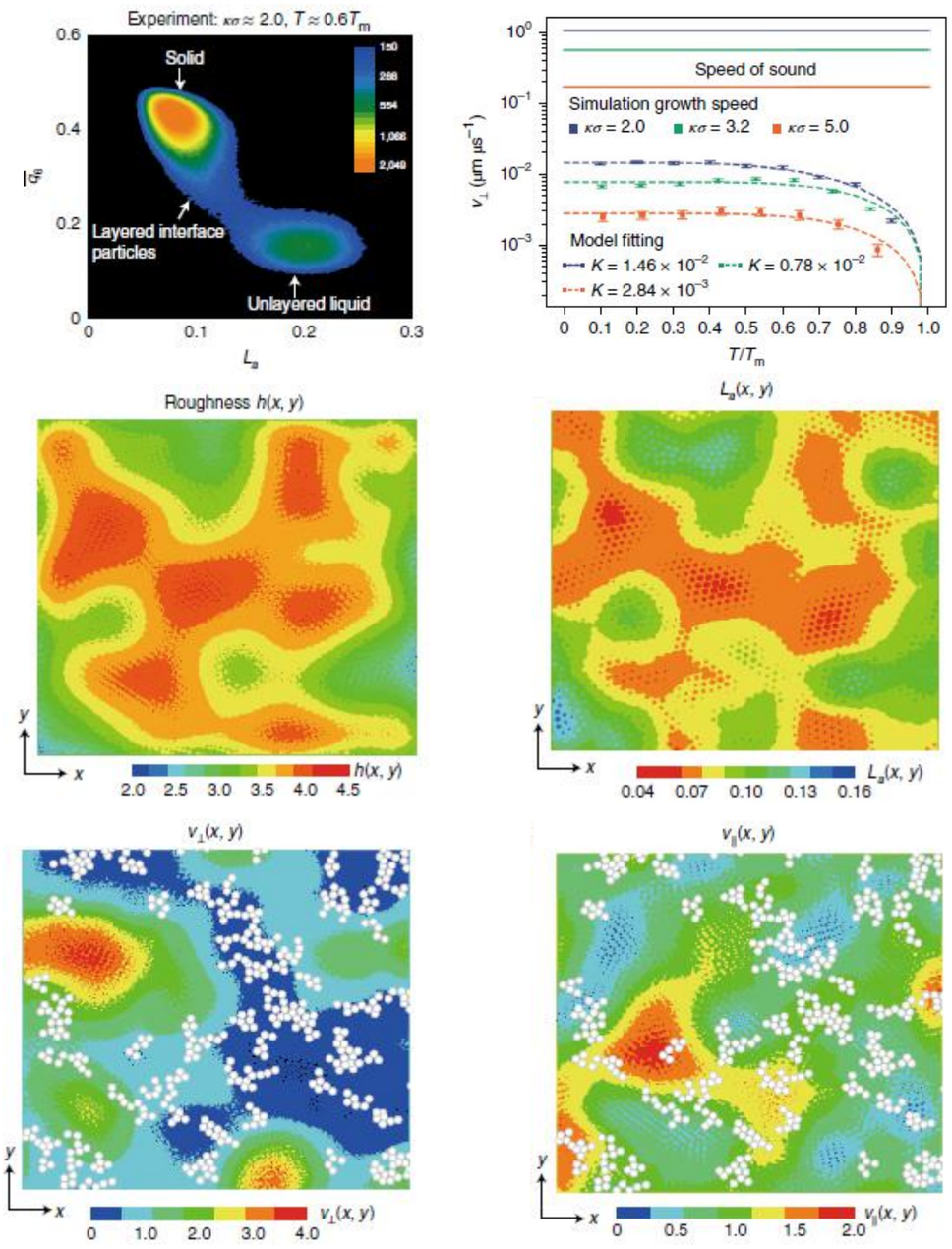
Fast crystal growth at ultra-low temperatures

Qiong Gao[1,9], Jingdong Ai[2,9], Shixiang Tang[1], Minhuan Li[1], Yanshuang Chen[1]
Jiping Huang[1], HuaTong [3,4,5], Lei Xu[2,7], Limei Xu[2,7], Hajime Tanaka[3,8] and Peng Tan[1]

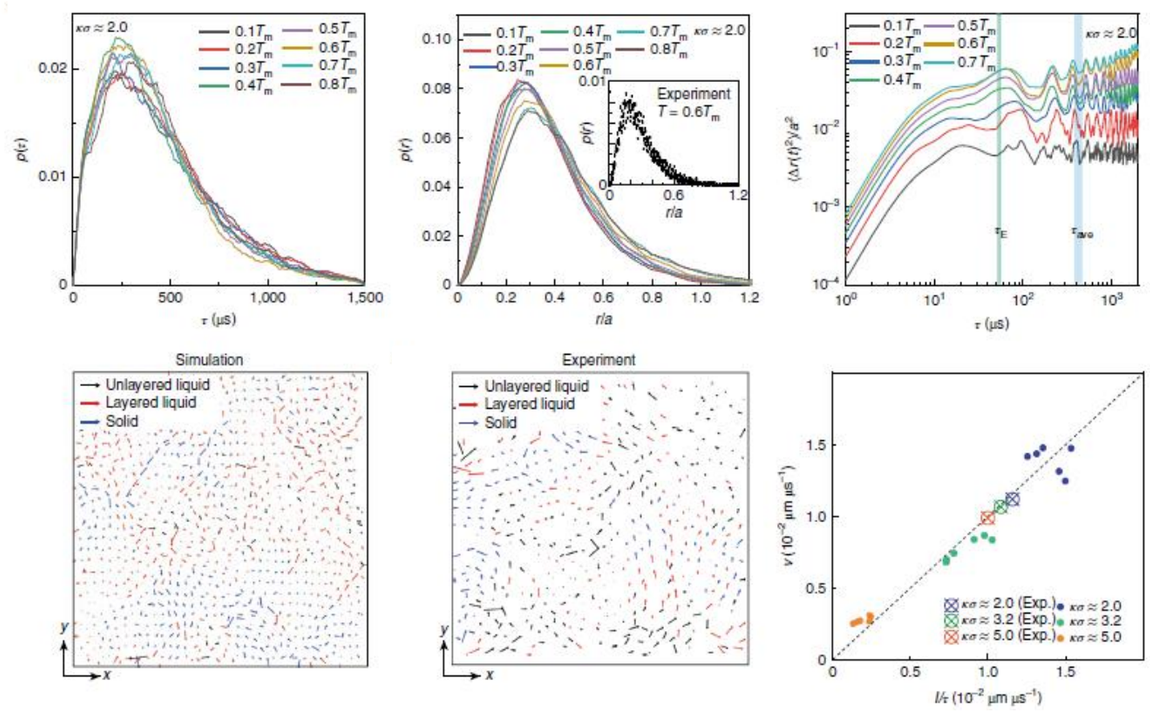
introduction

Slow liquid diffusion and geometric frustration brought by a rapid, deep quench inhibit fast crystallization and promote Vitrification. However many counterexamples have been reported. What is possible mechanism of fast crystal growth at deeply supercooling? how does the crystal growth process dissolve the disorder and determine the quality of the crystal?

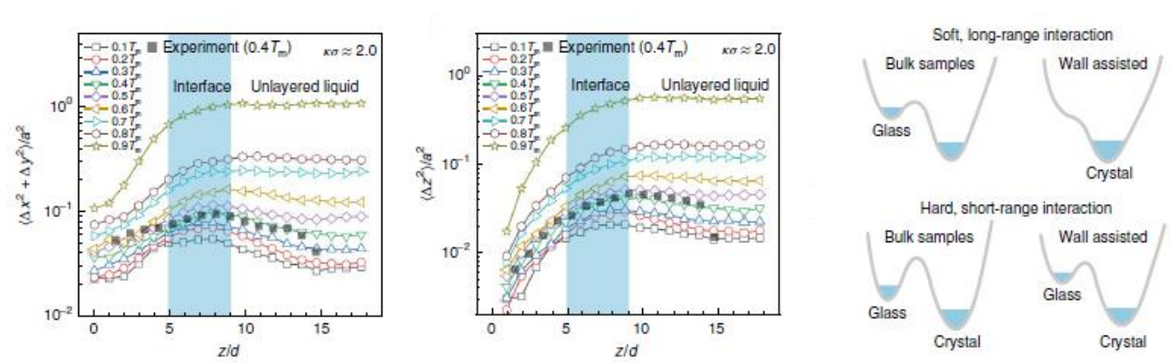
Interface structure profile



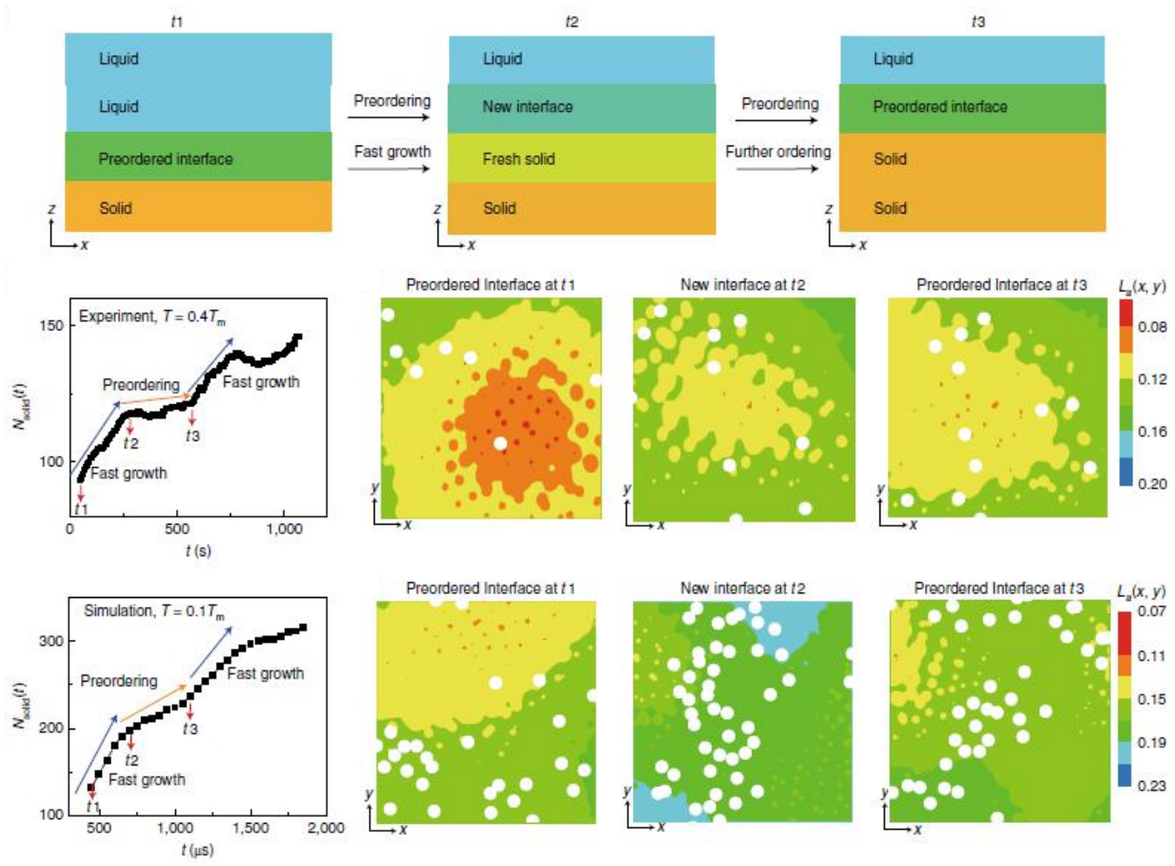
physical mechanism -- -Diffusionless



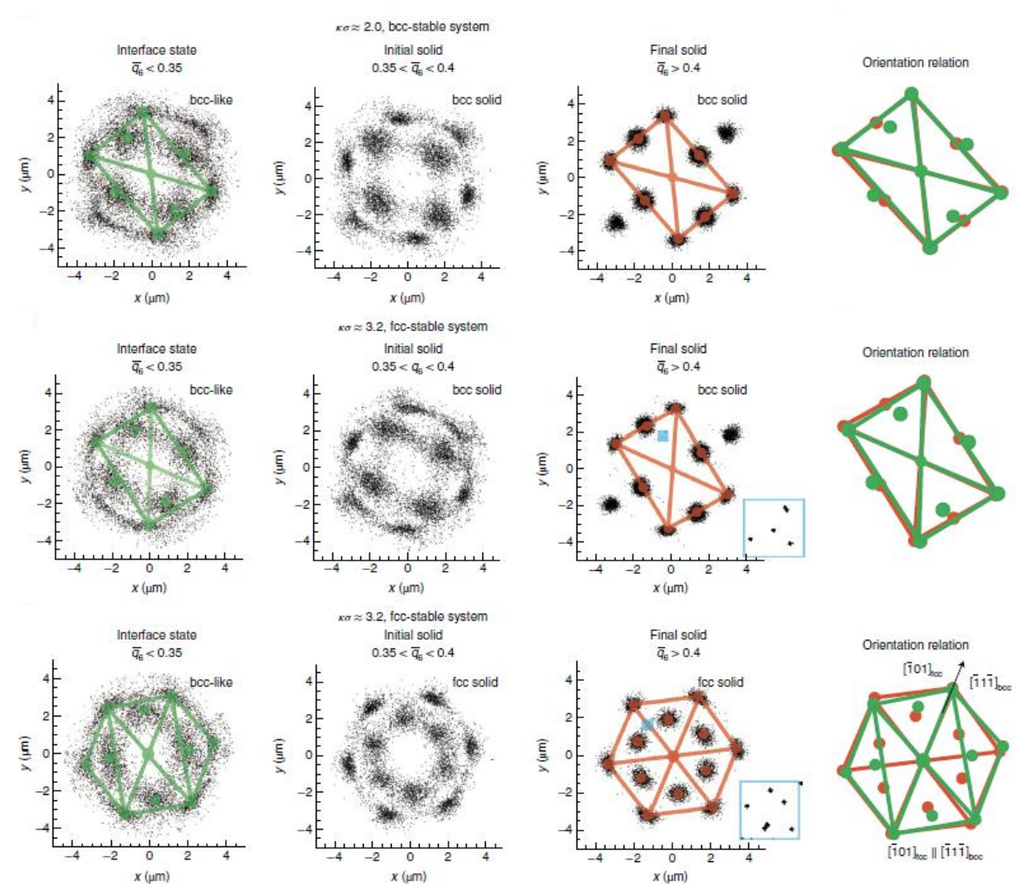
glass state is intrinsically mechanically unstable



crystallization pathways ---two step



Structural ordering inside the solid phase



Conclusion

fast crystal growth with a domino-like growth mode requires the ability to induce a rough and thick preordered interface. Another critical factor is the intrinsic mechanical instability of the glass state.

Gao, Q., Ai, J., Tang, S. *et al.* Fast crystal growth at ultra-low temperatures. *Nat. Mater.* (2021).