Improvement of the thermal field to reduce edge dislocation of cast monocrystalline silicon

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Research contents

➢ Research purpose

- Reduce edge defects around cast monocrystalline silicon ingots by optimizing the heat distribution at the bottom of the graphite DS block.

➢ Thermal field modification of cast monocrystalline silicon furnace with double power heaters.

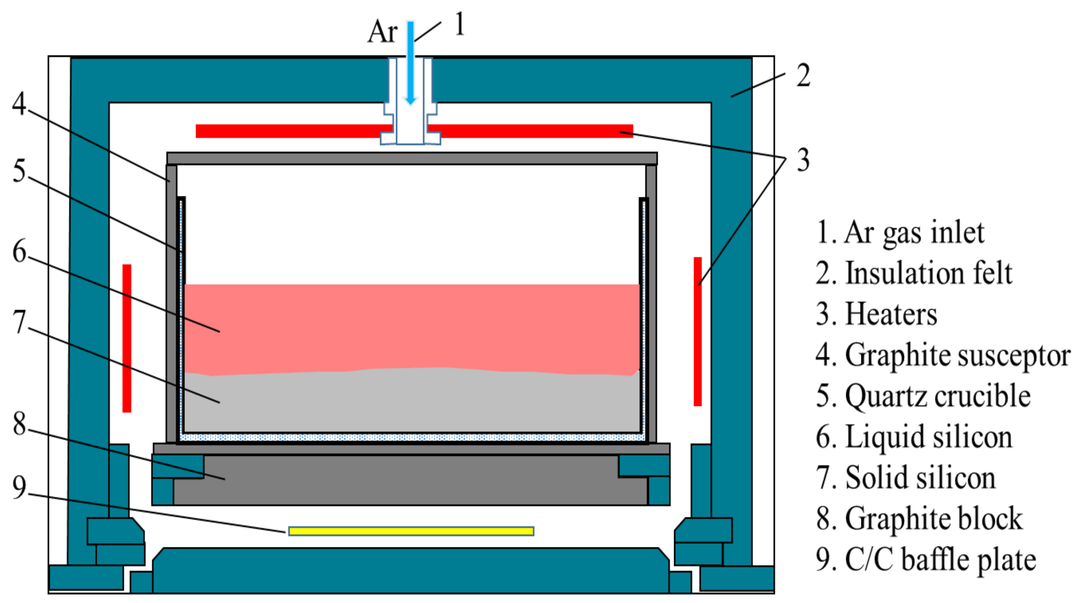

Fig. 1. Schematic diagram of thermal field after improvement.

➢ Experimental Condition

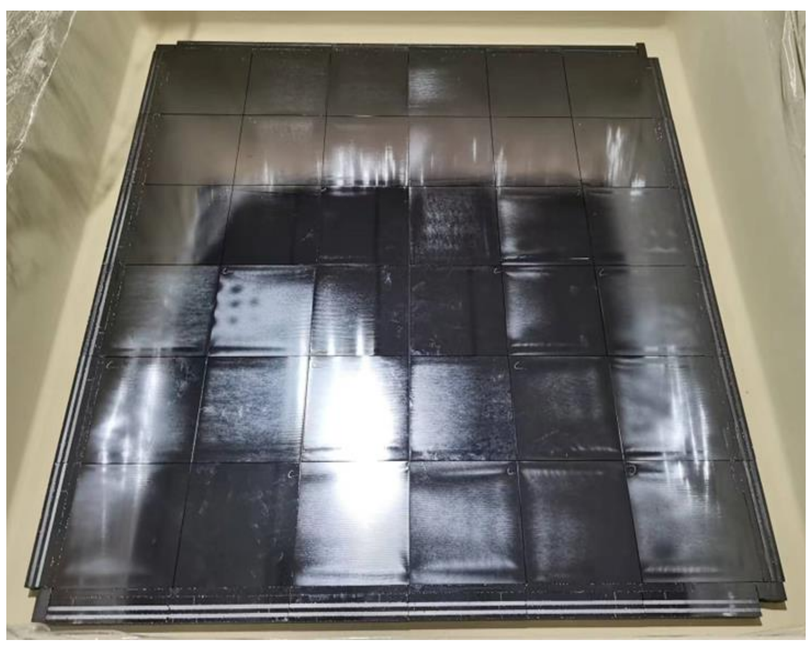

Fig. 2. Loading diagram of experimental silicon ingot

Result analysis

➢ Temperature distribution after thermal field optimization

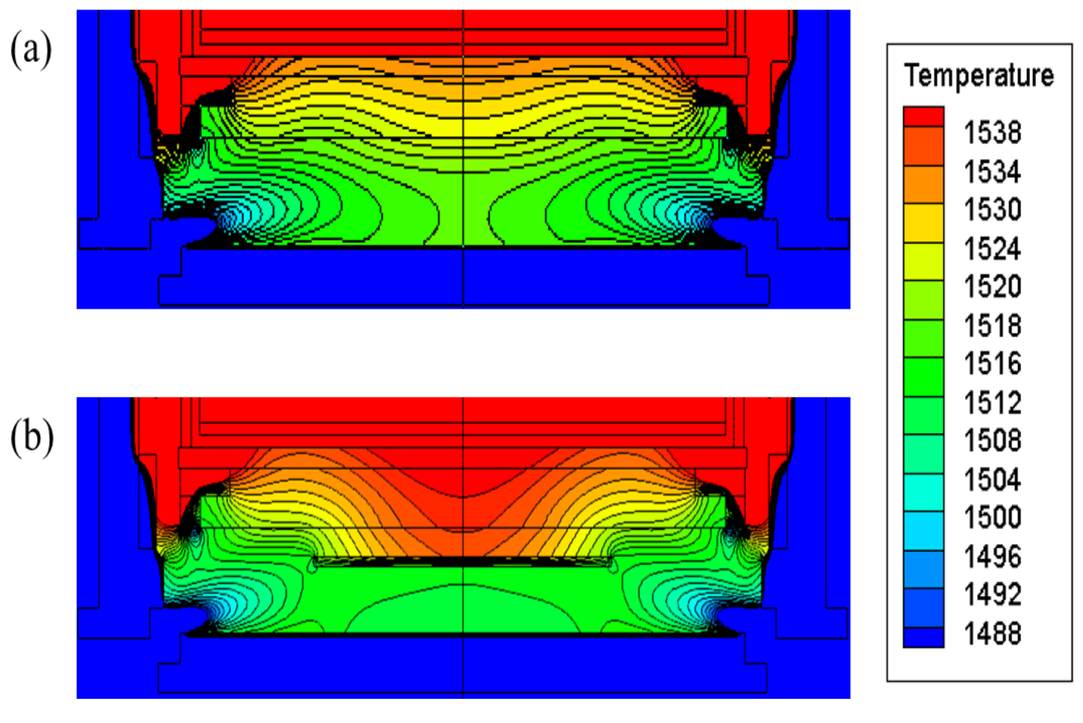

Fig. 3 Simulation comparison diagram of temperature distribution below DS block before (a) and after (b) improvement (Unit: K)

➢ Improvement effect of silicon ingot after thermal field optimization

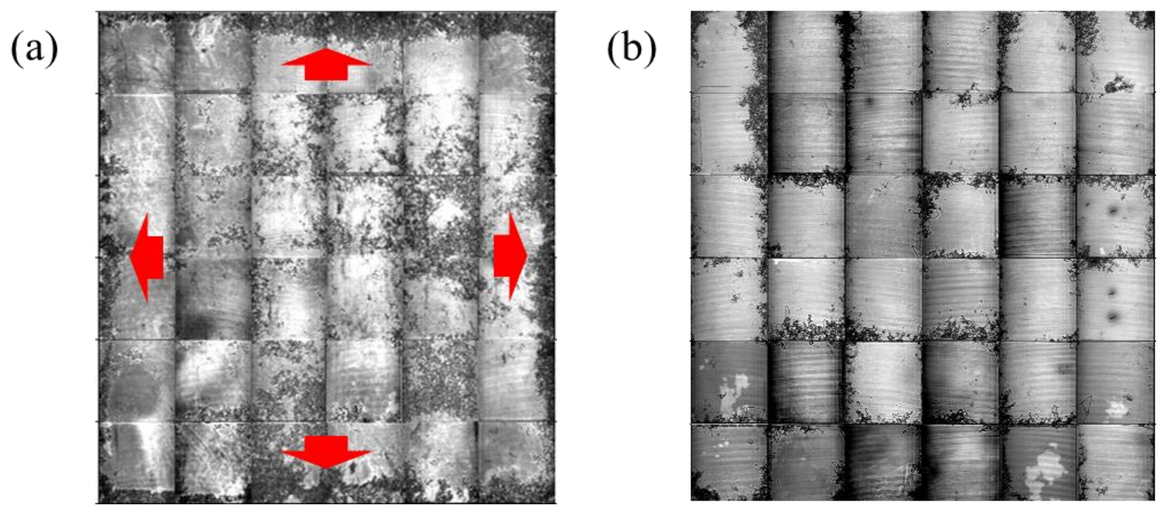

Fig. 4. PL test images of the crystal before (a) and after (b) the optimization of thermal field.

- The edge defects of silicon ingot are obviously improved after thermal field optimization.

Conclusions

1. A carbon baffle felt is added under the graphite DS block to optimize the bottom heat dissipation at the initial stage of crystal growth.
2. The central temperature under the DS block increases, which will affect the solid-liquid interface at the initial stage of crystal growth and reduce the edge defects.