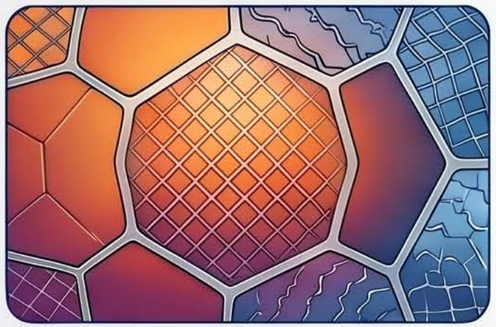
THE SCIENCE OF METAL RECOVERY: MODELING SUBGRAIN EVOLUTION IN INCONEL 718

Researcher have developed an advanced multilevel statistical model to act as a "**digital microscope**", tracking the evolution of subgrains in Inconel 718 during annealing by simulating processes like boundary migration and coalescence

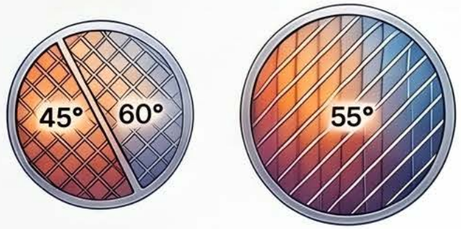
THE RECOVERY MECHANISMS

SUBGRAIN BOUNDARY MIGRATION



Boundaries move through diffusion, allowing larger subgrains to absorb smaller, defective neighbours.

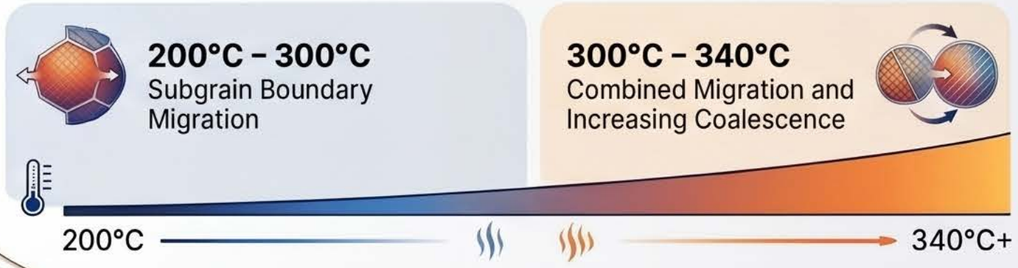
SUBGRAIN COALESCENCE



Adjacent subgrains rotate to align their lattices, merging into a single, larger structure.

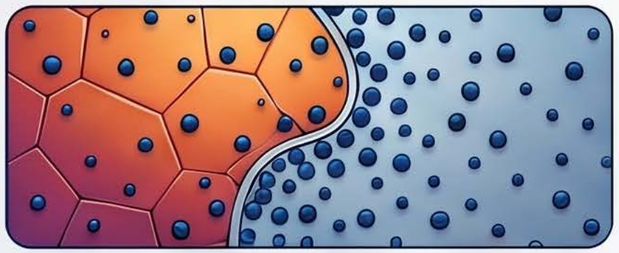
TEMPERATURE-DRIVEN COMPETITION

Migration dominates at lower temperatures, while coalescence becomes significantly more active above 300°C.



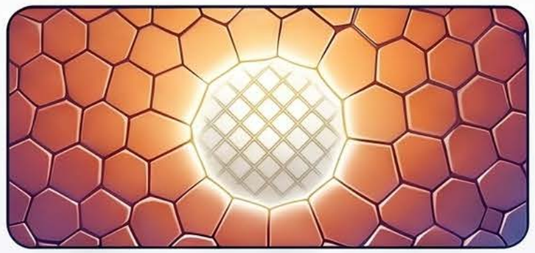
INFLUENCING FACTORS & MATERIAL IMPACT

THE ZENER PINNING EFFECT



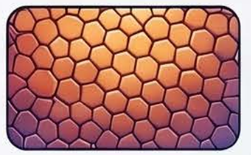
Second-phase particles in Inconel 718 act as "brakes," significantly slowing subgrain growth.

ABNORMAL SUBGRAIN GROWTH

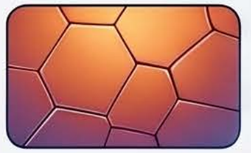


Rapidly growing "favourably oriented" subgrains serve as the primary nuclei for future recrystallization.

TAILORING MECHANICAL PROPERTIES



FINE SUBGRAINS
Enhance yield strength



LARGER STRUCTURES
Improve resistance to creep