THE ADVANCED CASTING RESEARCH CENTER – ACRC

Project Fact Sheet

THE CONTROLLED DIFFUSION SOLIDIFICATION PROCESS (CDS): FUNDAMENTALS AND PRINCIPLES

BENEFITS

CDS castings have a predominantly globular microstructure instead of a dendritic one.

CDS's globular microstructure results in improved castability and properties.

CDS process mitigates hot tearing in castings.

CDS is easy to apply in a production line with minimal capital investment.

IMPACT

Processing via CDS reduces hot-tearing tendency and allows direct casting of wrought alloys.

CDS reduces the grain size, which improves the mechanical properties.

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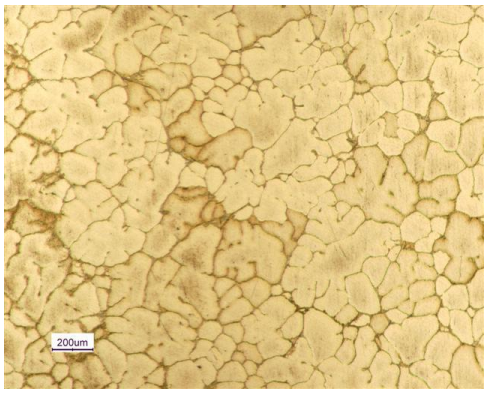
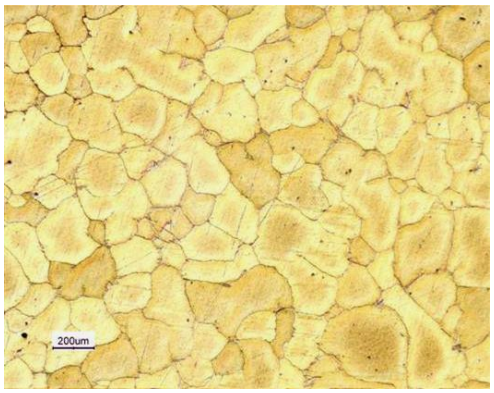
The mechanisms controlling Controlled Diffusion Solidification (CDS) were investigated. A theory of mixing, nucleation and growth has been proposed and verified via numerical models and experiments. Effect of processing parameters on the microstructure stability and hot tearing tendency of various wrought aluminum alloys were evaluated.

Microstructures of 206 alloy cast via conventional casting and the CDS process.



Conventional (dendritic microstructure)



CDS (globular microstructure)

206 Conventional - Moderate hot-tear

CDS (Free of hot-tears)