Research Programs

Chemistry-Microstructure-Properties Interactions in Aluminum Die Casting Alloys

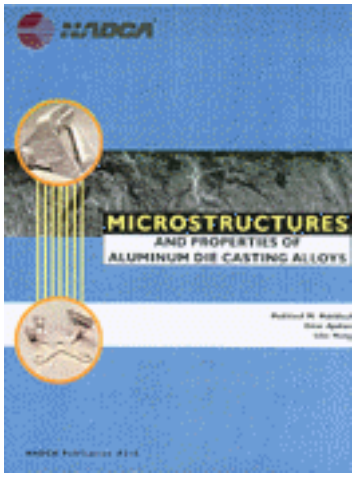
Partners:
The Cast Metal Coalition (CMC)
The North American Die Casting Association (NADCA)

Research Team:

Dr. Libo Wang
Prof. Diran Apelian
Prof. Makhlouf Makhlouf

The chemistry-microstructure-property relationships of aluminum alloys have been studied extensively; however, the information specific to die cast alloys is scattered and limited. The die-casting industry needed a systematic study of these relationships and a database that is specific to aluminum die-cast alloys. Consequently, this research program had two distinct objectives. The first was to establish relationships between alloy chemistry, alloy microstructure and die-cast properties and to provide information to optimize existing alloys, develop new alloys with enhanced properties, and develop new alloys with properties that are tailored to specific applications. The second was to provide an updated database of properties and microstructures for die-casting alloys. The project was structured in two Phases. Phase I consisted of two tasks: Task I was a comprehensive literature review of aluminum die casting alloys. Task II was a low-resolution study of the mechanical properties of A380 alloy. Two A380 alloys, one near the lower limits of the alloy specification and another near the upper limits of the alloy specification, were studied. Phase II was a more wide-ranging study in which the effect of ten alloying elements and their interactions on the mechanical and physical properties of die cast components was investigated. The properties measured are shown in the following table:

Metallurgical Integrity	**Mechanical Properties**	**Physical Properties**
	Room Temperature	
DTA/Cooling Curves	Tensile Strength, Yield Strength	Thermal Conductivity
Microstructural	Elongation, Charpy Impact, Fatigue	Electric Conductivity
Fracture Surface	Wear Resistance, Hardness	Specific Gravity
	Elevated Temperatures	
	Tensile Strength, Yield Strength	
	Elongation	



This work is the basis of a book entitled: "Alloy Chemistry-Microstructure-Properties Interactions in Aluminum Due Casting Alloys", by M. Makhlouf, L. Wang and D. Apelian that was published by the North American Die Casting Association in 1999.

The information included in this valuable reference enables foundrymen to take advantage of the full potential of die casting alloys, and provides design engineers with accurate data on die-cast parts.

PUBLICATIONS:

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