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Session: Emerging Materials and Processes for High Performance Aerospace Systems
Materials: Aluminum-Lithium

Aerospace Applications of Aluminum-Lithium Alloy Thick Plate

Acceptance of aluminum-lithium (Al-Li) alloys for aerospace applications has become more widespread following the emergence of commercially-viable product in the 1990's. The structural weight reduction and stiffness enhancement afforded by these alloys has resulted in cost savings which outstrip the premiums associated with material production and certification. Current generation Al-Li alloys are available in a variety of wrought forms including, but not limited to, sheet, plate, forgings and extrusions. Examples of commercial alloy applications include 2098 & 2297 (Lockheed Martin), 2196 (Airbus) and 2099 (Boeing & Airbus). Alloy development has become more refined, and processing technology has evolved, such that compositions tend to be tailored to specific product form. During potential application, specific (density-compensated) property improvements are addressed, but the issues of commercial availability and certification often remain. Therefore, the synergy between materials and structures engineers has become imperative during an era of budget constraints. A relevant example is the desire to utilize Al-Li alloy plate up to 5 inches thick for cryogenic tank and dry bay structures on future launch vehicles. The incumbent plate alloy is 2195, but alloy 2050 may prove to be a better choice for plate gages greater than 2 inches. The metallurgical issues relating to alloy selection in this particular application will be outlined in this presentation. The correlation of alloy composition/processing with microstructural characteristics and orientation-dependent mechanical properties will be discussed.