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MATERIALS GENOME INITIATIVE SEMINAR SERIES

Vacuum Induction Melting and Vacuum Arc Remelting of Co-Al-W-X Gamma-Prime Superalloys

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ABSTRACT Since J. Sato et al published the observation of the $L1_2$ gamma-prime phase in the Co-Al-W alloy system in 2006, there have been many publications characterizing the structure and properties of these alloys and measuring and assessing the thermodynamics of the alloy system. These publications have demonstrated that Co-Al-W alloys have promise as next generation high temperature materials due to the ability to engineer a high gamma-prime content alloy with a higher gamma-prime solvus and higher melting point than many Ni-base gamma-prime strengthened superalloys. Co-Al-W gamma-prime alloys are interesting as potential cast and wrought alloys because they have a relatively narrow range of solidification temperature and large range of temperature between the gamma-prime solvus and the solidus. This presentation will discuss manufacturing of superalloys used as forging stock for the production of aeroengine components such as rotating turbine disks or structural parts such as engine cases and rings. Material's characteristics that influence the manufacturability at commercial scale will be discussed with focus on ATI's experience in assessing the feasibility of manufacturing a cast and wrought billet product in the Co-Al-W-X alloy system. Three 22 kg heats were produced to examine a small range of alloy compositions of potential commercial interest: Co-9Al-9W, Co-9Al-10W-2Ti, and Co-9Al-10W-2Ti-0.02B, respectively. Each heat was vacuum-induction-melted and vacuum-arc-remelted then open-die forged. The as-cast microstructure has been characterized. Hot workability during billetizing will be described and static mechanical properties of hot worked product will be presented.

Erin McDevitt *earned his Ph.D. from the Department of Materials Science and Engineering in the at Northwestern University in 1998. His current role is Manager, Research and Development at ATI Specialty Materials in Monroe NC, a global leader in manufacturing Ni-base superalloys, Ti alloys, and specialty steels for aerospace, biomedical, and oil and gas markets. Erin joined ATI in 2005 and has led alloy and product development programs in Ni-base alloys and specialty steels, focusing on the new alloys ATI 718Plus, ATI 425, ATI S240, and ATI 13-8 SuperTough. Erin represents ATI on the Industry Steering Group of MMPDS and has served as ATI Specialty Materials' Technical Oversight Committee representative to the Metals Affordability Initiative since 2008. Erin has authored or coauthored 20 scholarly research papers in technical journals or conference proceedings, is a frequent presenter at industry technical conferences, and has 8 patents on topics ranging from specialty steels to hot dip galvanizing.*