AEROSPACE & MECHANICAL ENGINEERING

2011 COLLOQUIUM 2012
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INFORMAL COFFEE PERIOD BEFORE THE SEMINAR IN ROOM 365 FITZPATRICK HALL

UNIVERSITY OF NOTRE DAME, NOTRE DAME, INDIANA 46556

SPEAKER: **Matthew John M. Krane**
Associate Professor of Materials Engineering
Purdue Center for Metal Casting Research
Purdue University
West Lafayette, Indiana

TOPIC: **UNDERSTANDING SEGREGATION DEFECT FORMATION IN REMELTING PROCESSING OF HIGH TEMPERATURE ALLOYS**

DATE: Tuesday, November 29, 2011

TIME: 3:30 p.m.

PLACE: 138 DeBartolo Hall

ABSTRACT

Remelting processes provide routes to large ingots of specialty metals which have relatively few defects. However, past certain limits on size of the ingots and speed of these processes, several types of segregation related defects begin to occur. The heat, mass and momentum transfer and electromagnetics present during electroslag and vacuum arc remelting (ESR and VAR) are modeled and sump profiles and macrosegregation patterns are predicted. These results are studied as functions of process parameters and ingot geometry. During ESR of nickel-based superalloys, a maximum in macrosegregation is found as a function of filling velocity in the flow regime dominated by buoyancy. During VAR of titanium alloys, DC current levels are generally much higher than the AC current in ESR, so the sump flow is controlled by Lorentz forces, leading to different segregation patterns. The numerical simulations include studies of two distinctive flow regimes in VAR: strong counter-clockwise Lorentz driven flow and weak clockwise buoyancy driven flow. The results demonstrate possible influence of process instabilities on the flow regime and thus macrosegregation. Experimental validation of the models and other current projects on remelting processes will also be discussed.

NOTE: ***If you are interested in meeting individually with Prof. Krane, please contact Evelyn at 631-5431***