

MATERIALS ENGINEERING

SEMINAR

“Thermodynamics of Solute Segregation to Planar Defects”

By

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ABSTRACT

Solute segregation was originally proposed by Cottrell. In this original work, he proposed that interstitial atoms diffuse toward dislocations and, as a result of the diffusion, the interstitial atom relieves some of the associated stress field. The segregation event stabilizes the dislocation and results in a strengthening effect. In a similar way, Suzuki segregation in FCC materials was proposed as a segregation mechanism where, in the event of a stacking fault, solute segregates to the HCP stacking. It should be noted that for a Cottrell atmosphere, the segregation is driven by the strain field created around a dislocation, while in Suzuki segregation the segregation is driven by the change in crystal structure. This work provides an in-depth literature review of the segregation strengthening effect thermodynamics and the driving forces of solute segregation. Theoretical means to calculate planar defect energies and interaction energies are explored and validating experimental approaches are outlined. Ultimately, Suzuki segregation in the field of superalloys is explored and means to utilize the mechanism for informing alloy design strategies are discussed.

Date: Wednesday, July 27, 2022

Time: 1:00pm

Place: ARMS 1021 or WebEx via <https://purdue.webex.com/meet/titus9>



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