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Enhancing Materials Science & Engineering degrees and thereby engineering careers through targeted german instruction

Successful ATLANTIS & AMASE engineering students from Oregon State University are some of the most productive and high achieving professionals I have encountered in over 50 years of teaching. Bolstered by the customized language and cultural training they receive before arriving at UdS, those who survive the rigors of the materials science & engineering program emerge as highly trained global citizens.
To enable OSU undergraduate and graduate students to acquire the necessary German language proficiency, I use an innovative multi-pronged approach.
The foundation consists of 18 didacticized video episodes – originally developed for "Mind Extension University" in cooperation with Inter Nationes/Goethe Institute – supported by an integrated array of instructional elements. Interactive exercises enable students to receive instant feedback. As they progress, they engage multiple learning intelligences to maximize language acquisition and mastery and acquire familiarity with German culture and society. As students gain fluency and confidence, the curriculum is enriched with Scientific German modules that focus on Materials Science topics, providing invaluable language concepts and vocabulary. An intensive and immersive four-week conversation and cultural component is added in Germany, with host families, before students begin their degree program at UdS.

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Structural Origins of Fracture Toughness in Bulk Metallic Glasses

Bulk metallic glasses (BMGs) are alloys with exceptionally high strength, and they can range from very tough to brittle depending on their structural state. However, quantifying their structure-property relationships has been an unresolved challenge because their amorphous glassy structures lack the long-range order and crystalline defects that typically define the structure-property relationships for crystalline alloys. In this work, we examine how local hardness variations within BMG microstructures strongly affect the fracture behavior and how the glassy microstructures can be altered by thermomechanical treatments such as cold deformation and cryogenic cycling to enhance the fracture toughness. Moreover, we have demonstrated using nanobeam electron diffraction and fluctuation electron microscopy that the hardness heterogeneities are controlled by the size and volume fraction of FCC-like medium-range order (MRO) clusters. Additionally, we have proposed a model of ductile phase softening whereby relatively soft FCC-like MRO clusters sit in a matrix of harder icosahedral dominated ordering. Finally, the prospects for controlling the glassy structure and mechanical properties of BMGs using additive manufacturing by laser powder bed fusion will be discussed.