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Short Bio

Oana Cazacu graduated from University of Bucharest (Romania) with a joint B.S. and M.S. in Applied Mathematics in 1990, and earned a Ph.D. and Habilitation degree (HDR) from University of Lille, France in 1995 and 2004, respectively. She is currently Charles E. Taylor Professor in the Dept. of Mechanical and Aerospace Engineering of the University of Florida. She is Editor of the new *Plasticity of Materials* book series very recently launched by Elsevier, Associated Editor of *Mechanics Research Communications* (Elsevier) and *International Journal of Material Forming* (Springer).

Her main research interests lie in theoretical and computational solid mechanics with focus on multi-scale modeling of plasticity and damage in textured metals. Major contributions include the development of widely used anisotropic criteria for lightweight metals, now included in the built-in materials library of commercial and academic finite-element codes.

She has authored a book, 12 book chapters, edited and co-edited 4 books, and she has 87+ papers in refereed international journals, over 60 articles in proceedings of international conferences, 90 invited lectures in international conferences and research institutions (18 plenary or keynote lectures). She has been recipient of visiting chair professorships in Europe (e.g. University Pierre and Marie Curie (Paris-Sorbonne), University of Lille; Univ. of Lorraine, France), and Australia (Swinburne University).

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Rigorous framework for modeling plastic anisotropy with applications to predictions of quasi-static and high-rate deformation of textured metals

Abstract: It is presented a rigorous framework developed for formulation of constitutive models incorporating information at multiple length scales. Based on representation theory for tensor functions and scale-bridging theorems, this framework enables the development of constitutive models that account for the influence of crystallographic structures and deformation mechanisms on the macroscopic behavior. The advantage of adopting this framework is that it ensures that the derived constitutive relations automatically satisfy the material symmetries. Moreover, the minimal number of coefficients necessary to describe the anisotropy is specified. For example, it is demonstrated that an orthotropic plastic potential that is quadratic in stresses should involve exactly six independent anisotropy coefficients. For a non-quadratic potential the form-invariance requirements associated with orthotropic symmetries lead to at most seventeen independent anisotropy coefficients.

Next, it is presented a recent formulation which was developed in this framework for face-centered polycrystalline metallic materials ([1]). The capabilities of this 3-D plastic potential to capture the anisotropy in tensile properties for arbitrary orientation of the loading axis are discussed. The predictive capabilities are demonstrated through comparison with data on textured aluminum sheets.

Illustration of the generalized invariants based-approach to modeling both anisotropy and tension-compression asymmetry in yielding and plastic flow is next discussed. Applications of the developed plastic potential to the simulation of the quasi-static and dynamic response of titanium and zirconium are discussed.

Finally, main contributions towards elucidating the role of the plastic deformation on damage evolution are briefly presented. Special attention is given to addressing the open problems posed in the mechanics community in the late 1960's concerning the manner in which the matrix plastic behavior influences damage evolution [2].

References:
[1] Cazacu O. (2018) New yield criteria for isotropic and textured metallic materials. *Int J Solids Struct.* doi: https://doi.org/10.1016/j.ijsolstr.2018.01.036.
[2] Cazacu O, Revil-Baudard, B., Chandola, N. 2018: Plasticity-Damage Couplings:From Single Crystal to Polycrystalline Materials, Springer, ISBN 978-3-319-92921-7.