MECHANICAL ENGINEERING STUDENT SEMINAR

Thursday, July 04, 2024, at 13:00, D. Dan and Betty Kahn Building, Room 217.
Online: https://technion.zoom.us/j/98640350051

Correlating topological descriptors of nanoporous gold to its mechanical properties in atomistic simulations

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Stochastic nanoporous gold (NPG) structures gained significant interest in the research community due to their advantages as a lightweight structure with a high surface-to-volume ratio. These properties underscore the importance of optimizing and tailoring the mechanical properties of NPG structures though its topology and geometry. However, a quantitative correlation between structural features and mechanical properties remains elusive. In this study, we perform a systematic study to relate topological descriptors of NPG structures to their mechanical properties, specifically Young's modulus. First, the tool that was developed to generate stochastic NPG structures and analyze their topological descriptors will be discussed. The different topological descriptors calculated in this study are introduced. The analysis is applied to several hundred thousand structures and the distribution of the topological descriptors is explored. A subset of structures was chosen, and their mechanical properties are obtained using molecular dynamic (MD) simulations. In particular, Young's modulus of a few thousand structures was calculated. Finally, the correlations between the topological descriptors and Young's modulus will be discussed. The findings of this study enhance our understanding of how the structure of NPG affects its mechanical properties and can be used for future design and fabrication of printed NPG-like structures with tailored mechanical properties.