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Title: Investigation of alloy solute interactions at grain boundaries and interfaces in copper.

Abstract: Grain boundaries are internal interface between grains which govern a wide range of materials properties, including mechanical, optical and electrical behavior, often overshadowing the behavior of the bulk material itself. In nanomaterials, the contribution of these interfaces becomes more predominant as the number of atoms at grain boundaries is a bigger proportion of the total atoms than in case of a bulk material. Solute segregating to some or all of these boundaries can change the energy, mobility, structure and cohesion of boundaries through electronic interactions with the surrounding matrix. In this project, we are examining the nature of these interactions using a combination of analytical electron backscattered diffraction, transmission electron microscopy, and electron energy loss spectroscopy. These results will be used to investigate and understand the correlations between the atomic and electronic structures at grain boundaries of copper alloys, to enable future materials-by design for the semiconductor industry.