Discovery oriented learning of processing-structure-property relations in real-world materials through 3-D printed models and accompanying laboratory sessions

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Abstract:

From a purely thermodynamic point of view, it can be argued that practically any crystalline material contains a large number of disorders in their 3-dimensional atomic packing. On the other hand, the atomic scale structure in materials is typically taught in classroom from the viewpoint of a perfect 3-dimensional network of a repeating simple motif consisting of neighboring atoms. This creates a dichotomy in the mind of students, whereby the whole significance of crystal structure towards understanding of structure-property correlations in materials is lost. The project aims at correcting this situation by creating new teaching modules to inculcate in students the evolving modern concepts of atomic scale structure in functional materials, which places disorder as a central theme. The intended improvement in curriculum will be aided by better visualization such as 3-D printed models and through accompanying laboratory sessions. This will truly create a discovery-enriched pedagogy for the student to better appreciate the central role of disorder towards processing-structure-property correlations.