

Rethinking the Meaning of Defect Structure

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We often think of defects such as grain boundaries, dislocation cores, surfaces,... as a specific, well-defined structure. There is considerable evidence that in fact the structure of individual defects is not well-defined and is statistically distributed. I will discuss some recent work on grain boundaries that shows the extremely wide range of metastable states that are possible and the structural origin of this multiplicity of states. This plethora of states has profound influence on the statistical mechanics of such structures - this puts bounds rather than values on defect properties. Perhaps, more importantly, defect kinetics necessarily explore these variety of states - e.g., grain boundary point defect sink/source behavior, migration, sliding.