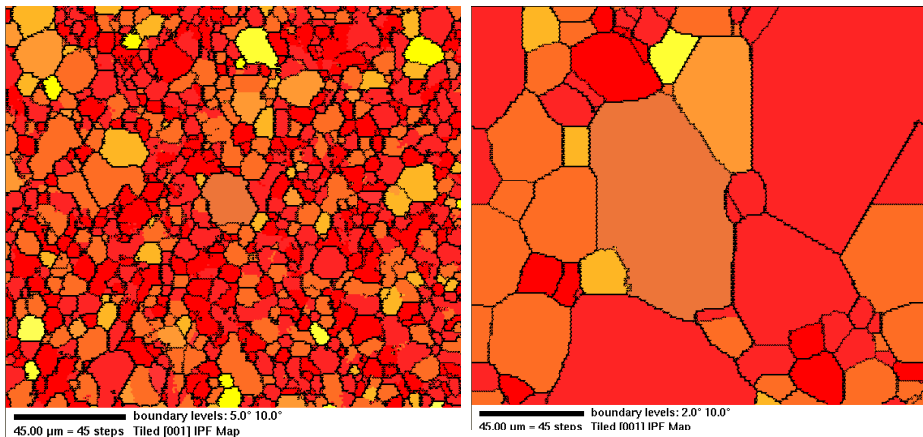


## Experimental Determination of Relative Grain Boundary Mobilities in Al Alloys

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The “design” of new microstructures is frequently discussed as a way to make polycrystalline structural materials with improved performance. Improved polycrystalline materials are of importance to numerous engineered systems including aircraft, integrated circuits, and data storage devices. However, microstructural design is not possible without knowledge of the physio-chemical properties of the grain boundaries. We have recently developed a technique to measure these important properties and used it to determine the grain boundary energy and mobility for Al, a material used in both aircraft and integrated circuits. Knowledge of these physical properties, when combined with established thermodynamic rules for microstructure evolution and existing computer models, makes it possible to predict how a microstructure will evolve. In fact, the microstructural changes that are observed when real aluminum specimens are heated can be reproduced using a computer simulation that includes the measured grain boundary properties. The availability of techniques to measure grain boundary properties opens up the possibility of actually designing new polycrystalline materials by computer.



An aluminum microstructure, evolved by computer simulation according to grain boundary energy and mobility data measured at CMU, reproduces the textural components observed in experiments.