

M A T H E M A T I C A L P H Y S I C S S E M I N A R

Rutgers University
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**Grain growth with surface effects: coupled mean curvature
motion and surface diffusion**

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Abstract

A very large number of studies have been undertaken which focus on grain growth in polycrystalline specimens, relatively few take into account the finiteness of the specimen and the effects of the ambient atmosphere. Resultant phenomena may include pitting, hole formation, possible acceleration though more typically slowing of grain boundary motion, annihilation of small grains accompanied by a transition from convexity to concavity of their exterior surface, and understanding such phenomena is crucial in controlling the stability of thin films. Analysis of these effects involves a system of equations in which motion by mean curvature is coupled with surface diffusion. In certain thin film geometries, a partial decoupling of the two motions occurs and the motion of the grain boundary becomes prescribed to leading order by the evolution of the exterior surface. We plan to discuss some of the phenomena and some of the mathematics behind the models, as well as to give some indication of how our results may be influential in the measurements of the kinetic coefficients for mean curvature motion and surface diffusion.

Joint work with V. Derkach, E. Rabkin, A. Vilenkin, A. Zigelman