תנועה לפי עקמומיות ולפי דיפוזיה על פני משטח:
סימטריות ופתרונות מיוחדים

ו' דרקץ, ח' קאלנטרובה, א' נוביק־כהן, מתמטיקה

ראה תקציר באנגלית למטה.

דרישות קדם: מבוא למת' שימושית, מד"ר א'. **רקע מועיל:** מד"ח, גיאומטריה דיפרנציאלית, מכניקת הרצף.

Mean Curvature and Surface Diffusion Motions:
Symmetries and Special Solutions

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Metals are often characterized by a network of grains, which sometimes can be observed as patches on the surface of metals. The grain size is typically correlated to the mechanical properties of the metal, such as hardness, strength, and ductility.

The boundaries between the grains, known as grain boundaries, are assumed in simplistic models to evolve by mean curvature motion, namely by

$$V_n = A\kappa. \tag{1}$$

Here V_n is the normal velocity of the manifold describing a grain boundary and κ is its mean curvature. The exterior surface of the grains is often modeled as evolving by surface diffusion motion, namely by

$$V_n = -B\triangle_s\kappa, \tag{2}$$

where now V_n is the normal velocity of the manifold describing an exterior grain surface, κ is its mean curvature, and $\triangle_s$ is the Laplace-Beltrami operator.

We shall explore (1), (2), focusing on symmetries and special solutions.

Prerequisites: Intro Applied Math, ODEs (Madar Aleph). **Potentially helpful:** Intro PDEs, Differential Geometry, Continuum Mechanics.

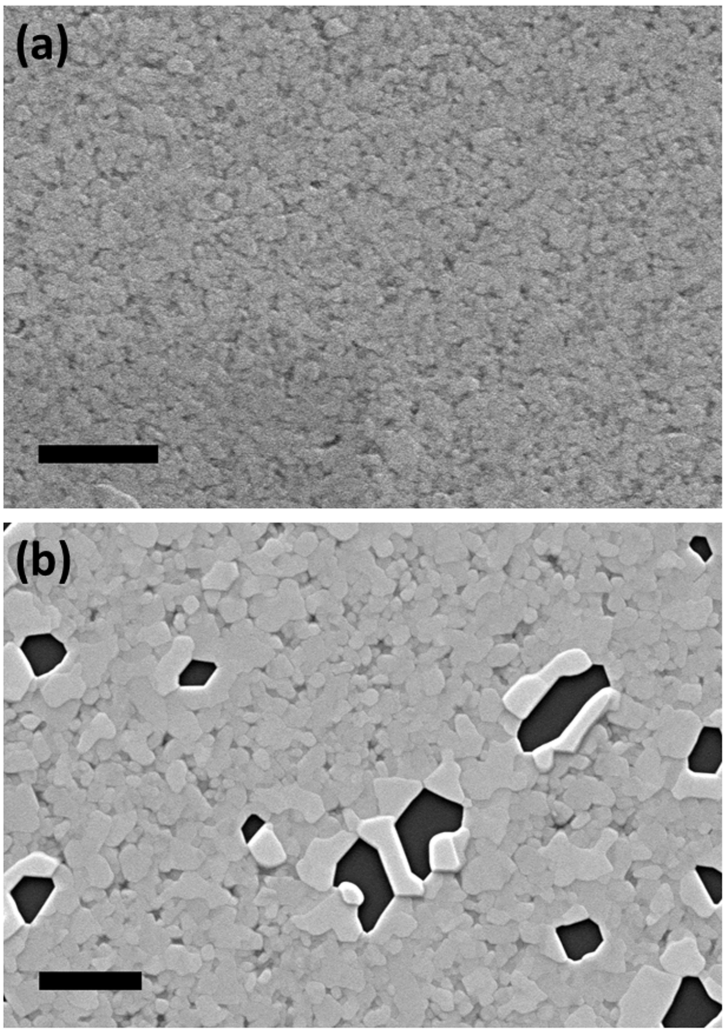

Figure 1: Scanning electron microscopy (SEM) images of a thin molybdenum (metal) film on a sapphire (ceramic) substrate: (a) as initially deposited, (b) after annealing at 940 °C for 60 min (E. Rabkin, Mat. Sci. Eng., Technion).